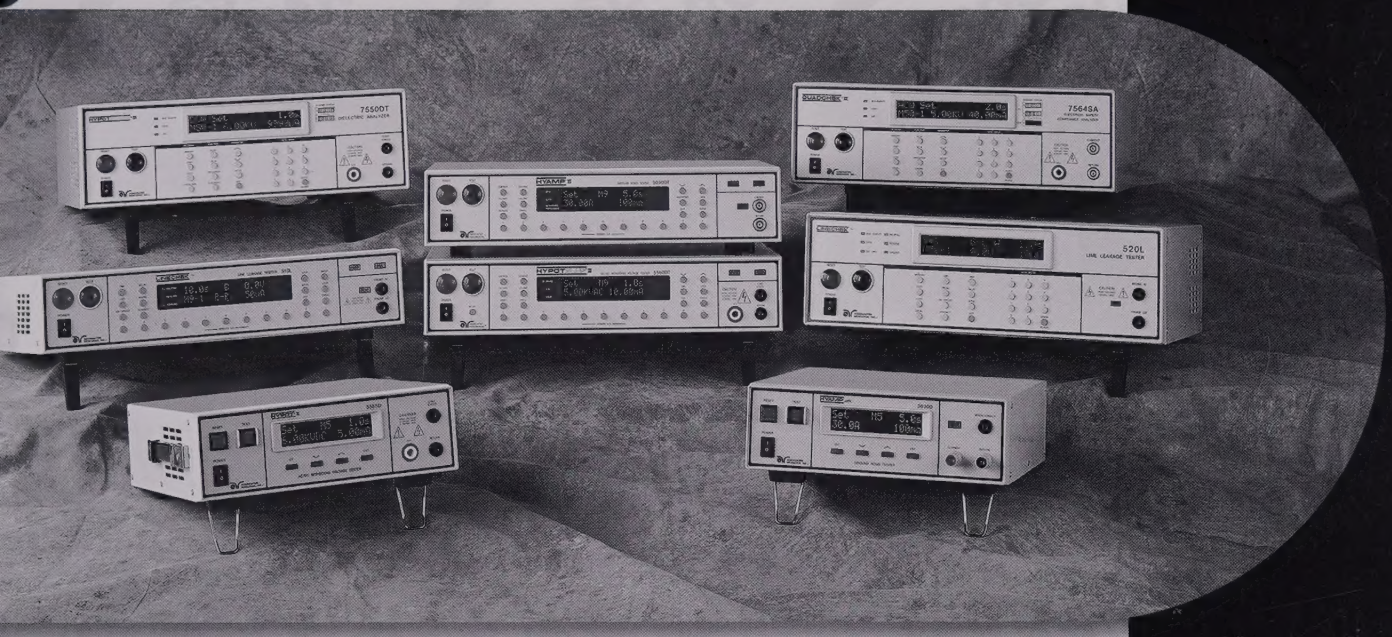

Operation and Service Manual

For Technical Assistance:

1-800-858-TEST(8378)

Models

3500D/3505D

3565D/3570D

Item 37589 *Ver 3.18*

ASSOCIATED RESEARCH, INC.®

Electrical Safety Compliance Testing Is Our Only Focus

13860 W. Laurel Dr., Lake Forest, IL 60045 U.S.A. Tel: 847-367-4077 Fax: 847-367-4080
E-mail: info@asresearch.com Web: www.asresearch.com

OPERATION AND SERVICE MANUAL

Hypot ® II

MODEL 3500D (AC ONLY HIPOT WITH GROUND CONTINUITY CHECK)
MODEL 3505D (ENHANCED AC ONLY HIPOT WITH GROUND CONTINUITY CHECK)
MODEL 3565D (ENHANCED AC/DC HIPOT WITH GROUND CONTINUITY CHECK)
MODEL 3570D (ENHANCED AC/DC HIPOT WITH IR AND GROUND CONTINUITY)

SERIAL NUMBER

Models
3500D/3505D
3565D/3570D

Item 37589 *Ver 3.18*

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13860 West Laurel Drive
Lake Forest, Illinois, 60045-4546
U.S.A.

Printed Nov 6, 2000

5 YEAR WARRANTY POLICY

Associated Research, Inc., certifies that the instrument listed in this manual meets or exceeds published manufacturing specifications. This instrument was calibrated using standards that are traceable to the National Institute of Standards and Technology (NIST).

Your new instrument is warranted to be free from defects in workmanship and material for a period of (1) year from date of shipment. Options and accessories that are external to the instrument are warranted for a period of (90) days from date of shipment. You must return the "Owners Registration Card" provided within (15) days from receipt of your instrument.

AR recommends that your instrument be calibrated on a twelve month cycle. Instruments purchased and used in North America only, may have their warranty extended in one year increments to a maximum of (5) years provided they are returned to AR at least annually for calibration and inspection. The annual calibration and inspection must be performed annually each and every year following receipt of instrument. Any instrument not calibrated and inspected annually will not be eligible for extended warranty status. This extended warranty is non-transferable and is offered only to the original purchaser.

A return material authorization (RMA) must be obtained from AR before returning this instrument for warranty service. Please contact our Customer Support Center at 1-800-858-TEST (8378) to obtain an RMA number. It is important that the instrument is packed in its original container for safe transport. If the original container in not available please contact our customer support center for proper instructions on packaging. Damages sustained as a result of improper packaging will not be honored. Transportation costs for the return of the instrument for warranty service must be prepaid by the customer. AR will assume the return freight costs when returning the instrument to the customer. The return method will be at the discretion of Associated Research.

Except as provided herein, Associated Research makes no warranties to the purchaser of this instrument and all other warranties, express or implied (including, without limitation, merchantability or fitness for a particular purpose) are hereby excluded, disclaimed and waived.

Any non-authorized modifications, tampering or physical damage will void your warranty. Elimination of any connections in the earth grounding system or by-passing any safety systems will void this warranty. This warranty does not cover batteries or accessories not of Associated Research manufacture. Parts used must be parts that are recommended by AR as an acceptable specified part. Use of non-authorized parts in the repair of this instrument will void the warranty.

TABLE OF CONTENTS

SECTION I OPERATORS MANUAL **1**

SAFETY 2

INTRODUCTION 6

SPECIFICATIONS 12

CONTROLS 18

INSTALLATION 21

QUICK START 24

OPERATION 27

OPTIONS 42

SECTION II SERVICE MANUAL **45**

CALIBRATION 46

PARTS LIST 49

SCHEMATICS 50

SECTION 1
OPERATORS MANUAL

SAFETY PRECAUTIONS REQUIRED FOR HIGH VOLTAGE TESTING!

GENERAL:

This product and its related documentation must be reviewed for familiarization with safety markings and instructions before operation.

This product is a Safety Class I instrument (provided with a protective earth terminal).

Before applying power verify that the instrument is set to the correct line voltage (115 or 230) and the correct fuse is installed.

INSTRUCTION MANUAL SYMBOL. PLEASE REFER TO THE INSTRUCTION MANUAL FOR SPECIFIC WARNING OR CAUTION INFORMATION TO AVOID PERSONAL INJURY OR DAMAGE TO THE PRODUCT.

INDICATES HAZARDOUS VOLTAGES MAY BE PRESENT.

CHASSIS GROUND SYMBOL.

WARNING

CALLS ATTENTION TO A PROCEDURE, PRACTICE, OR CONDITION, THAT COULD POSSIBLY CAUSE BODILY INJURY OR DEATH.

CAUTION

CALLS ATTENTION TO A PROCEDURE, PRACTICE, OR CONDITION, THAT COULD POSSIBLY CAUSE DAMAGE TO EQUIPMENT OR PERMANENT LOSS OF DATA.

A Hipot produces voltages and currents which can cause **harmful or fatal electric shock.** To prevent accidental injury or death, these safety procedures must be strictly observed when handling and using the test instrument.

SERVICE AND MAINTENANCE

User Service

To prevent electric shock do not remove the instrument cover. There are no user serviceable parts inside. Routine maintenance or cleaning of internal parts is not necessary. Any external cleaning should be done with a clean dry or slightly damp cloth. Avoid the use of cleaning agents or chemicals to prevent any foreign liquid from entering the cabinet through ventilation holes or damaging controls and switches, also some chemicals may damage plastic parts or lettering. Schematics, when provided, are for reference only. Any replacement cables and high voltage components should be acquired directly from Associated Research, Inc. Refer servicing to an Associated Research, Inc. authorized service center.

ASSOCIATED RESEARCH, INC.
13860 WEST LAUREL DRIVE
LAKE FOREST, IL 60045-4546 U.S.A.

☎PHONE: 1 (847) 367-4077
1 (800) 858-TEST (8378)
FAX: 1 (847) 367-4080
E-MAIL : info@asresearch.com
www.asresearch.com

Service Interval

The instrument and its power cord, test leads, and accessories must be returned at least once a year to an Associated Research authorized service center for calibration and inspection of safety related components. Associated Research will not be held liable for injuries suffered if the instrument is not returned for its annual safety check and maintained properly.

User Modifications

Unauthorized user modifications will void your warranty. Associated Research will not be responsible for any injuries sustained due to unauthorized equipment modifications or use of parts not specified by Associated Research. Instruments returned to Associated Research with unsafe modifications will be returned to their original operating condition at your expense.

TEST STATION

Location

Select an area away from the main stream of activity which employees do not walk through in performing their normal duties. If this is not practical because of production line flow, then the area should be roped off and marked for **HIGH VOLTAGE TESTING**. No employees other than the test operators should be allowed inside.

If benches are placed back-to-back, be especially careful about the use of the bench opposite the test station. Signs should be posted: **"DANGER - HIGH VOLTAGE TEST IN PROGRESS - UNAUTHORIZED PERSONNEL KEEP AWAY."**

Power

Dielectric Voltage-Withstand Test Equipment must be connected to a good ground. Be certain that the power wiring to the test bench is properly polarized and that the proper low resistance bonding to ground is in place.

Power to the test station should be arranged so that it can be shut off by one prominently marked switch located at the entrance to the test area. In the event of an emergency, anyone can cut off the power before entering the test area to offer assistance.

Work Area

Perform the tests on a nonconducting table or workbench, if possible.

There should not be any metal in the work area between the operator and the location where products being tested will be positioned.

Position the tester so the operator does not have to reach over the product under test to activate or adjust the tester. If the product or component being tested is small, it may be possible to construct guards or an enclosure, made of a non-conducting material such as clear acrylic, such that the item being tested is within the guards or enclosure during the test, and fit them with switches so that the tester will not operate unless the guards are in place or the enclosure closed.

Keep the area clean and uncluttered. All test equipment and test leads not absolutely necessary for the test should be removed from the test bench and put away. It should be clear to both the operator and to any observers which product is being tested, and which ones are waiting to be tested or have already been tested.

Do not perform Hipot tests in a combustible atmosphere or in any area where combustible materials are present.

TEST OPERATOR

Qualifications

This instrument generates voltages and currents which can cause **harmful or fatal electric shock** and must only be operated by a skilled worker trained in its use.

The operator should understand the electrical fundamentals of voltage, current, and resistance.

Safety Procedures

Operators should be thoroughly trained to follow these and all other applicable safety rules and procedures before they begin a test. Defeating any safety system should be treated as a serious offense and should result in severe penalties, such as removal from the Hipot

testing job. Allowing unauthorized personnel in the area during a test should also be dealt with as a serious offense.

Dress
Operators should not wear jewelry which could accidentally complete a circuit.

Medical Restrictions
This instrument should not be operated by personnel with heart ailments or devices such as pacemakers.

TEST PROCEDURES

!NEVER PERFORM A HIPOT TEST ON ENERGIZED CIRCUITRY OR EQUIPMENT!

If the instrument has an external safety ground connection be sure that this is connected. Then Connect the return lead **first** for any test regardless of whether the item under test is a sample of insulating material tested with electrodes, a component tested with the high voltage test lead, or a cord-connected device with a two or three prong plug.

Plug in the high voltage test lead only when it is being used. Handle its clip only by the insulator---**never touch the clip directly.** Be certain that the operator has control over any remote test switches connected to the Hipot. Double check the return and high voltage connections to be certain that they are proper and secure.

NEVER TOUCH THE ITEM UNDER TEST OR ANYTHING CONNECTED TO IT WHILE HIGH VOLTAGE IS PRESENT DURING THE HIPOT TEST.

WARNING When testing with DC, always discharge the capacitance of the item under test and anything the high voltage may have contacted--such as test fixtures--before handling it or disconnecting the test leads.

HOT STICK probes can be used to discharge any capacitance in the item under test as a further safety precaution. A hot stick is a nonconducting rod about two feet long with a metal probe at the end which is connected to a wire. To discharge the device under test, two hot sticks are required. First connect both probe wires to a good earth ground. Then touch one probe tip to the same place the return lead was connected. While holding the first probe in place, touch the second probe tip to the same place where the high voltage lead was connected.

KEY SAFETY POINTS TO REMEMBER:

- Keep unqualified and unauthorized personnel away from the test area.
- Arrange the test station in a safe and orderly manner.
- Never touch the product or connections during a test.
- In case of any problem, turn off the high voltage first.
- Properly discharge any item tested with DC before touching connections.

GLOSSARY OF TERMS

(as used in this manual)

Alternating Current, AC: Current which reverses direction on a regular basis, commonly in the U.S.A. 60 times per second, in other countries 50 times per second.

Breakdown: The failure of insulation to effectively prevent the flow of current, sometimes evident by arcing. If voltage is gradually raised, breakdown will begin suddenly at a certain voltage level. Current flow is not directly proportional to voltage. Once breakdown current has flown, especially for a period of time, a repeated application of voltage will often show breakdown beginning at a lower voltage than initially.

Conductive: Having a volume resistivity of no more than 10^3 ohm-cm or a surface resistivity of no more than 10^5 ohms per square.

Conductor: A solid or liquid material which has the ability to let current pass through it, and which has a volume resistivity of no more than 10^3 ohm-cm.

Current: The movement of electrons through a conductor. Current is measured in amperes, milliamperes, microamperes, nanoamperes, or picoamperes. Symbol = **I**

Dielectric: An insulating material which is positioned between two conductive materials in such a way that a charge or voltage may appear across the two conductive materials.

Direct Current, DC: Current which flows in one direction only. The source of direct current is said to be polarized and has one terminal which is always at a higher potential than the other.

Hipot Tester: Common term for dielectric-withstand test equipment.

Hypot®: Registered trademark of Associated Research, Inc., for its dielectric-withstand test equipment.

Insulation: Gas, liquid or solid material which has a volume resistivity of at least 10^{12} ohm-cm and is used for the purpose of resisting current flow between conductors.

Insulation Resistance Tester: An instrument or a function of an instrument capable of measuring resistance's in excess of 200 megohms. Usually employs a higher voltage power supply than used in ohmmeters measuring up to 200 megohms.

Leakage: AC or DC current flow through insulation and over its surfaces, and AC current flow through a capacitance. Current flow is directly proportional to voltage. The insulation and/or capacitance is thought of as a constant impedance, unless breakdown occurs.

Resistance: That property of a substance which impedes current and results in the dissipation of power in the form of heat. The practical unit of resistance is the *ohm*. Symbol = **R**

Trip Point: The minimum current flow required to cause an indication of unacceptable performance during a dielectric voltage-withstand test.

Voltage: Electrical pressure, the force which causes current through an electrical conductor. Symbol = **V**

INTRODUCTION

The importance of testing... User safety

In an era of soaring liability costs, original manufacturers of electrical and electronic products must make sure every item is as safe as possible. All products must be designed and built to prevent electric shock, even when users abuse the equipment or by-pass built in safety features.

To meet recognized safety standards, one common test is the "dielectric voltage-withstand test". Safety agencies which require compliance safety testing at both the initial product design stage and for routine production line testing include: Underwriters Laboratories, Inc. (UL), the Canadian Standards Association (CSA), the International Electrotechnical Commission (IEC), the British Standards Institution (BSI), the Association of German Electrical Engineers (VDE), the Japanese Standards Association (JSI). These same agencies may also require that an insulation resistance test and high current ground bond test be performed.

The Dielectric Withstand (Hipot) Test....

The principle behind a dielectric voltage - withstand test is simple. If a product will function when exposed to extremely adverse conditions, it can be assumed that the product will function in normal operating circumstances.

The most common applications of the dielectric-withstand test are:

- Design (performance) Testing.... determining design adequacy to meet service conditions.
- Production Line Testing.... detecting defects in material or workmanship during processing.
- Acceptance Testing.... proving minimum insulation requirements of purchased parts.
- Repair Service Testing.... determine reliability and safety of equipment repairs.

The specific technique varies with each product, but basically, during a dielectric voltage - withstand test, an electrical devise is exposed to a voltage significantly higher than it normally encounters. The high voltage is continued for a given period of time.

If, during the time the component is tested, stray current flow remains within specified limits, the device is assumed to be safe under normal conditions. The basic product design and use of the insulating material will protect the user against electrical shock.

The equipment used for this test, a dielectric-withstand tester, is often called a "hipot" (for high potential tester). The "rule of thumb" for testing is to subject the product to twice its normal operating voltage, plus 1,000 volts.

However, specific products may be tested at much higher voltages than 2X operating voltages + 1,000 volts. For example, a product designed to operate in the range between 100 to 240 volts, can be tested between 1,000 to 4,000 volts or higher. Most "double insulated" products are tested at voltages much higher than the "rule of thumb".

Testing during development and prototype stages is more stringent than production run tests because the basic design of the product is being evaluated. Design tests usually are performed on only a few samples of the product. Production tests are performed on each and every item as it comes off the production line.

The hipot tester must also maintain an output voltage between 100% and 120% of specification. The output voltage of the hipot must have a sinusoidal waveform with a frequency between 40 to 70 Hz and has a peak waveform value that is not less than 1.3 and not more than 1.5 times the root-mean-square value.

Advantages and Disadvantages of AC Testing and DC Testing....

Please check with the Compliance Agency you are working with to see which of the two type of voltages you are authorized to use. In some cases a Compliance Agency will allow either AC or DC testing to be done. However in other cases the Compliance Agency only allows for an AC test. If you are unsure which specification you must comply with please contact our **CUSTOMER SUPPORT GROUP at 1-800-858-TEST (8378).**

Many safety agency specifications allow either AC or DC voltages to be used during the hipot test. When this is the case the manufacturer must make the decision on which type of voltage to utilize. In order to do this it is important to understand the advantages and the disadvantages of both AC and DC testing.

AC testing characteristics

Most items that are hipot tested have some amount of distributed capacitance. An AC voltage cannot charge this capacitance so it continually reads the reactive current that flows when AC is applied to a capacitive load.

AC testing advantages

1. AC testing is generally much more accepted by safety agencies than DC testing. The main reason for this is that most items being hipot tested will operate at AC voltages and AC hipot testing offers the advantage of stressing the insulation alternately in both polarities which more closely simulates stresses the product will see in real use.

2. Since AC testing cannot charge a capacitive load the current reading remains consistent from initial application of the voltage to the end of the test. Therefore, there is no need to gradually bring up the voltage since there is no stabilization required to monitor the current reading. This means that unless the product is

sensitive to a sudden application of voltage the operator can immediately apply full voltage and read current without any wait time.

3. Another advantage of AC testing is that since AC voltage cannot charge a load there is no need to discharge the item under test after the test.

AC testing disadvantages

1. A key disadvantage of AC testing surfaces when testing capacitive products. Again, since AC cannot charge the item under test, reactive current is constantly flowing. In many cases the reactive component of the current can be much greater than the real component due to actual leakage. This can make it very difficult to detect products that have excessively high leakage current.

2. Another disadvantage of AC testing is that the hipot has to have the capability of supplying reactive and leakage current continuously. This may require a current output that is actually much higher than is really required to monitor leakage current and in most cases is usually much higher than would be needed with DC testing. This can present increased safety risks as operators are exposed to higher currents.

DC testing characteristics

During DC hipot testing the item under test is charged. The same test item capacitance that causes reactive current in AC testing results in initial charging current which exponentially drops to zero in DC testing.

DC testing advantages

1. Once the item under test is fully charged the only current flowing is true leakage current. This allows a DC hipot tester to clearly display only the true leakage of the product under test.

2. The other advantage to DC testing is that since the charging current only needs to be applied momentarily the output power requirements of the DC hipot tester can typically be much less than what would be required in an AC tester to test the same product.

DC testing disadvantages

1. Unless the item being tested has virtually no capacitance it is necessary to raise the voltage gradually from zero to the full test voltage. The more capacitive the item the more slowly the voltage must be raised. This is important since most DC hipots have failure shut off circuitry which will indicate failure almost immediately if the total current reaches the leakage threshold during the initial charging of the product under test.

2. Since a DC hipot does charge the item under test it becomes necessary to discharge the item after the test.

3. DC testing unlike AC testing only charges the insulation in one polarity. This becomes a concern when testing products that will actually be used at AC voltages. This is a key reason that some safety agencies do not accept DC testing as an alternative to AC.

4. When performing AC hipot tests the product under test is actually tested with peak voltages that the hipot meter does not display. This is not the case with DC testing since a sinewave is not generated when testing with direct current. In order to compensate for this most safety agencies require that the equivalent DC test be performed at higher voltages than the AC test. The multiplying factor is somewhat inconsistent between agencies which can cause confusion concerning exactly what equivalent DC test voltage is appropriate.

The Ground Continuity Test

The Ground Continuity test is checking to verify that there is low impedance path between the chassis and the safety ground wire of the line cord. A low impedance ground system is critical in ensuring that in the event of a product failure a circuit breaker on the input line will act quickly to protect the user from any serious electrical shock.

International compliance agencies such as CSA, IEC, TÜV, VDE, BABT and others, have requirements calling out this test. A low current test merely indicates that there is a safety ground connection, it does not completely test the integrity of that connection that would be accomplished when using much higher currents in the range from 10 to 30amps. The high current test is know as a Ground Bond test.

The Ground Continuity test verifies that the ground circuit between the Continuity and Return panel jacks on the Hypot II is below 1ohm while test at a current of 100mA. This function can be enabled or disabled through software, when a ground circuit is not provided on the device under test or test requirement are not needed.

The Insulation Resistance Test....

Some "dielectric analyzers today come with a built in insulation resistance tester. Typically the IR function provides test voltages from 500 to 1,000 volts DC and resistance ranges from kilohms to gigaohms. This function allows manufacturers to comply with special compliance regulations. BABT, TÜV and VDE are agencies that may under certain conditions require an IR test on the product before a Hipot test is performed. This typically is not a production line test but a performance design test.

The insulation resistance test is very similar to the hipot test. Instead of the go/no go indication that you get with a hipot test the IR test gives you an insulation value usually in Megohms. Typically the higher the insulation resistance value the better the condition of the insulation. The connections to perform the IR test are the same as the hipot test. The

measured value represents the equivalent resistance of all the insulation which exists between the two points and any component resistance which might also be connected between the two points.

Although the IR test can be a predictor of insulation condition it does not replace the need to perform a Dielectric Withstand test.

TYPES OF FAILURES DETECTABLE ONLY WITH A HIPOT TEST

- Weak Insulating Materials
- Pinholes in Insulation
- Inadequate Spacing of Components
- Pinched Insulation

IF YOU SHOULD HAVE ANY QUESTIONS RELATING TO THE OPERATION OF YOUR INSTRUMENT CALL 1-800-858-TEST(8378) IN THE U.S.A.

Model 3500D, 3505D, 3565D and 3570D
Functional Specifications

Unless otherwise stated, accuracy's are relative to a laboratory standard measurement.

DIELECTRIC WITHSTAND TEST MODE	
Descriptions	Specifications
INPUT VOLTAGE	115 / 230V selectable, ± 15 % variation 47 - 63 Hz
FUSE	115 VAC, 230VAC -- 3.15A fast acting 250VAC
OUTPUT	Rating AC 0 - 5000V, 2V / step, 12mA DC 0 - 6000V, 2V / step, 5mA (DC mode on 3565D and 3570D only) Regulation : ± (1 % of output + 5V)
VOLTAGE SETTING	0V - Max output rating, 10 volts/step Accuracy : ± (2 % of Setting + 5V) (relative to displayed output) Can be adjusted during operation via UP and DOWN arrow keys.
OUTPUT FREQUENCY	3500D, 3505D : 50 / 60 Hz selectable 3565D and 3570D : DC and 50 / 60 Hz selectable
WAVE FORM	Sinewave, Distortion : <2 % THD
RIPPLE	< 5 % at 6KVDC / 5mA (3565D and 3570D only)
DWELL TIME SETTING	0 and 0.2 - 999.9 seconds, 0.1 second / step "0" for continuous running
RAMP TIME SETTING	Model 3505D, 3565D and 3570D 0 and 0.2 - 999.9 seconds, 0.1 second / step 0 ramp setting = 0.1 seconds fixed ramp Model 3500D and 3505D Ramp = 0.1 seconds fixed
FAILURE SETTINGS	AC mode High limit : 0.10 - 12.00 mA, 0.01 mA / step Low limit : 0.00, 0.10 - 12.00 mA, 0.01 mA / step (0= OFF) (3505D, 3565D and 3570D only) Accuracy : ± (2 % of setting + 0.02 mA) DC mode High limit : 0.02 - 5.00 mA, 0.01 mA / step Low limit : 0.00, 0.02 - 5.00 mA, 0.01 mA / step (0= OFF) (3505D, 3565D and 3570D only) Accuracy : ± (2 % of setting + 0.02 mA)

Descriptions	Specifications
METERING	Voltmeter (4 digits) Range : AC 0.00 - 5.00 KV : DC 0.00 - 6.00 KV Resolution : .01 KV Accuracy : ± (2 % of reading + 10 V) Ammeter (4 digits) Range : AC 0.10 - 12.00 mA : DC 0.02 - 5.00 mA Resolution : 0.01 mA Accuracy : ± (2 % of reading + 0.02mA)
TIMER DISPLAY	Range : 0.0 - 999.9 seconds Resolution : 0.1 second Accuracy : ± (0.1 % of reading + 0.05 seconds)
DISCHARGE TIME	≤ 300 ms The maximum capacitive load vs output voltage : 0.20 µF --- < 1KV 0.050 µF --- < 4KV 0.10 µF --- < 2KV 0.040 µF --- < 5KV 0.06 µF --- < 3KV 0.015 µF --- < 6KV
GROUND CONTINUITY CHECK	Current : DC 0.1 A ± 0.01A, fixed Max. ground resistance : 1 Ω ± 0.1Ω, fixed
INSULATION RESISTANCE TEST MODE	
Output Voltage	Range: 100 - 1000 Volts DC Resolution: 10 volt/step Accuracy: ± (2% of reading + 5 volts)
Voltage Display	Range: 0 - 1000 V Resolution: 10 volt/step Accuracy: ± (2% of reading + 2 counts)
Resistance Display	Range: 1 - 1000 MΩ (4 Digit, Auto Ranging) Resolution: 500VDC 1000VDC MΩ MΩ MΩ 0.01 1.00 - 40.00 1.00 - 80.00 0.1 35.0 - 999.9 75.0 - 999.9 Accuracy: ± (3% of reading + 2 counts) at test voltage > 500V ± (7% of reading + 2 counts) at test voltage ≤ 500V

Descriptions	Specifications	
High Resistance Limit	Range:	0 - 1000 MΩ (0 = Off)
Low Resistance Limit	Range:	1 - 1000 MΩ
Delay Timer	Range:	0, 0.5 - 999.9 sec (0 = Constant)
	Resolution:	0.1 sec/step
	Accuracy:	± (0.1% + 0.05 sec)
GENERAL		
REMOTE CONTROL AND SIGNAL OUTPUT	The following input and output signals are provided through the 9 pin D type connector; 1. Remote control : test and reset 2. Outputs : pass, fail and test in process	
PROGRAM MEMORY	5 Sets (3505D, 3565D and 3570D only)	
SECURITY	Lockout capability to avoid unauthorized access to test set-up program.	
LINE CORD	Detachable 7 ft. (2.13m) power cable terminated in a three prong grounding plug.	
TERMINATIONS	5ft.(1.52m) high voltage and return leads (2) with clips and a standard U.S. style (NEMA 5-15) remote receptacle box for testing items terminated with a line cord. International receptacles also available.	
MECHANICAL	Tilt up front feet. Dimensions: (W x H x D) 11 x 3.5 x 14.56 in. (280 x 89 x 370 mm) Weight: 20 lbs (9 Kgs)	
ENVIRONMENTAL	Operating Temperature : 32° - 113°F (0° - 45°C) Relative Humidity - 0 to 95%	
CALIBRATION	Traceable to National Institute of Standards and Technology (NIST). Calibration controlled by software. Adjustments are made through front panel keypad in a restricted access calibration mode. Calibration information stored in non-volatile memory.	

KEY FEATURES & BENEFITS OF Hypot II

1. No load setup of trip current and output voltage.
   This provides the operator with an easy and safe way to set trip currents and output voltages since parameters are set without the high voltage activated.

2. Automatic storage of test program.
   Hypot II powers up with the parameters that were used during the last test to avoid operator set-up errors.

3. All parameters for the setups can be adjusted through a simple menu driven program.
   The easy to follow setup screens ensure that the operator correctly sets up all test parameters.

4. Tamper proof front panel controls.
   This makes it possible to limit user access to the setup screens so that only authorized personnel with a security code can change test parameters.

5. Line and load regulation.
   This system maintains the output voltage to within 1% from no load to full load and over the line voltage range to ensure that test results remain consistent and within safety agency requirements..

6. The LCD display allows monitoring of current down to 100 microamps AC and 20 microamps DC.
   This allows the Hypot II to be used even when test requirements only allow a very low level of acceptable leakage current.

7. Electronic dwell settings.
   The electronic dwell control helps keep test results consistent by ensuring that the test duration is the same for each product tested.

8. PLC remote inputs and outputs.
   The standard 9 pin interfaces provide outputs for Pass, Fail, and Test in Process. Inputs include Test and Reset. This gives the user all the basic remotes required to configure the Hypot II through simple PLC relay control.

9. Front panel LCD displays test parameters and results.
   A front panel LCD allows the operator to monitor the test. The display holds the results after a test item failure so that the operator can easily review the test results. Indications of high fail and continuity failure are clearly displayed.

10. Maximum output current 12 milliamps AC and 5 milliamps DC.
    *This makes this instrument a **true** hipot tester with enough output current to test capacitive loads in AC mode and allows the instrument to comply with the UL "120 K ohm" requirements.*

11. Software calibration control.
Hypot II is calibrated through the front panel keypad. All calibration information is stored in non-volatile memory. This allows Hypot II to be completely calibrated without removing any covers and exposing the technician to hazardous voltages.

12. User selectable output voltage frequencies of 50 or 60 hertz.
Hypot II was designed for the global market. This feature makes it simple for the user to select the output frequency in the AC hipot mode so that products can be tested at the same frequency they will be used at.

13. Output voltage fine adjustment.
To make Hypot II usable in all types of applications, the operator can manually bring the voltage up or down in 10 volt increments by simply pressing the up and down arrow keys. This makes it very easy to adjust the output voltage even while Hypot II is in the dwell mode so you can analyze test results at different voltages.

14. Built-in Continuity test mode.
Hypot II meets ground continuity test requirements called out by UL and other safety agencies.

15. Flashing high voltage indicator.
A flashing LED located directly over the high voltage terminal clearly indicates when high voltage is active to provide maximum operator safety.

16. Comes complete with a test box for products terminated in a line cord.
The standard US style receptacle box allows easy testing of hipot and continuity on line cord terminated products. As an additional benefit, termination boxes are available for testing products with line cords configured for other countries.

17. User selectable input voltage.
Hypot II can be switched for either 115 or 230 volt input operation through an easy access rear panel mounted switch to allow it to be used in any country.

18. Low-current sense. *
Monitors the minimum level of current flow, thus ensuring that the DUT is properly connected and that the hipot test is being performed.

19. Electronic ramping. *
Provides a gradual and timed method to increase output voltage to the DUT, minimizing any damage from quickly over-applying high voltage to sensitive DUTs.

20. Test setup memories. *
The operator can store and recall test setups, thus eliminating the need to re-enter setup information.

21. Insulation Resistance Test Mode **

This allows the operator to perform an Insulation Resistance test independently or in sequence with the Dielectric Withstand (Hipot) test, thus eliminating the need for a separate piece of test equipment when IR testing is required.

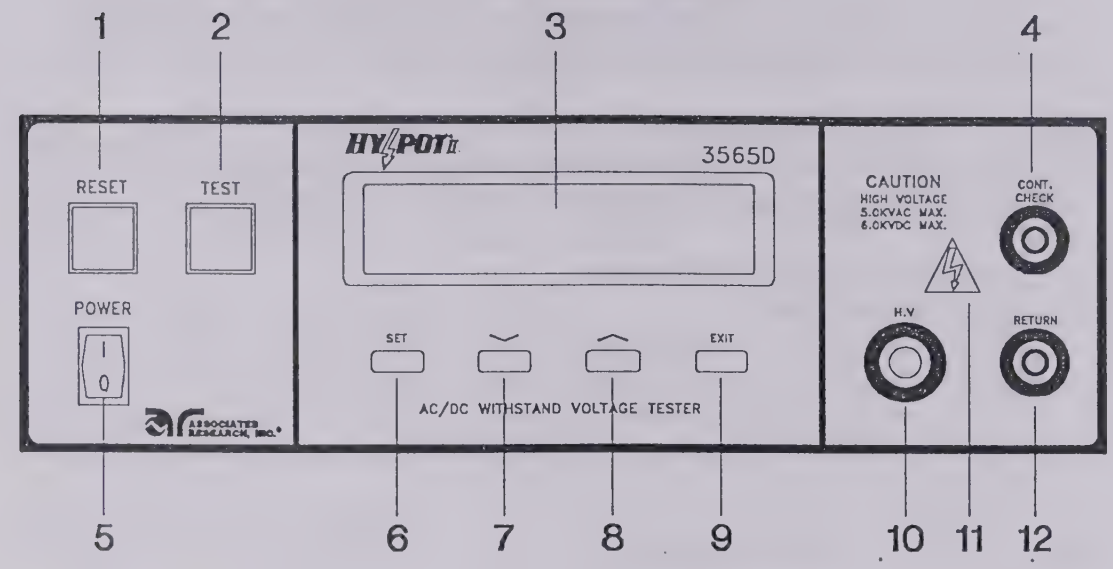
22. Insulation Resistance Adjustable Output **

The Insulation Resistance test mode provides an adjustable output range of 100-1000 volts DC. This gives the user the ability to meet most IR test requirements.

* *Only available on model 3505D, 3565D and 3570D.*

** *Only available on model 3570D*

FRONT PANEL CONTROLS



1. **RESET SWITCH:** This is a momentary contact switch. If an out-of-range reading is detected during a hipot test or an IR test or if continuity failure occurs, the red failure lamp within the switch will light. To reset the system for the next test, press and release this switch. This switch may also be used to abort a test in progress.

2. **TEST SWITCH:** This is a momentary contact switch. Press the green switch to turn on the high voltage output when in test mode. The indicator lamp within the switch will light when continuity is "good", if continuity mode is enabled.

3. **LCD DISPLAY:** The Liquid Crystal Display is the main readout for the operator and programmer of the test settings and test results.

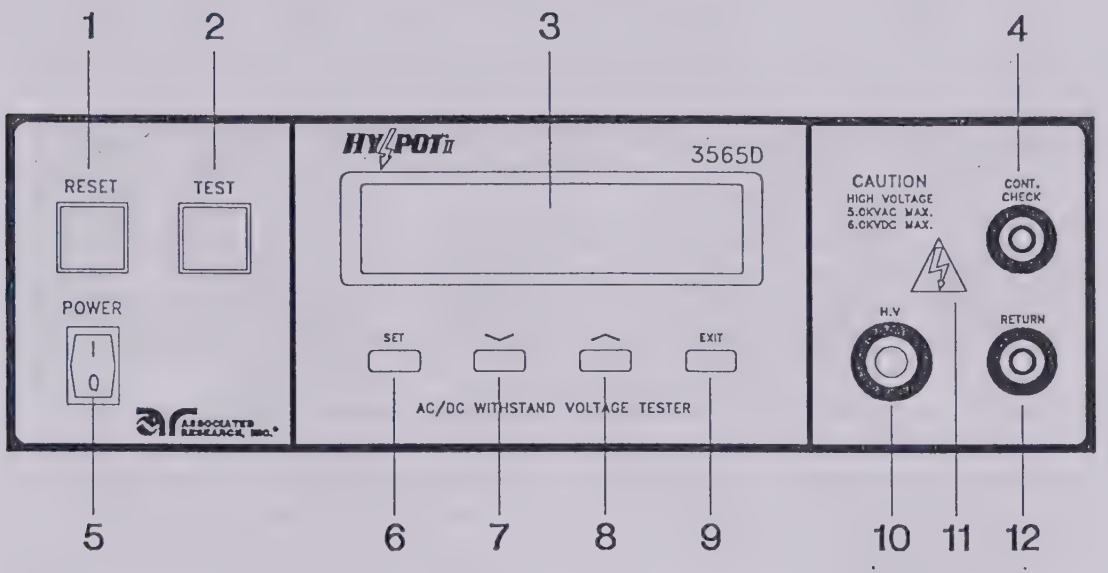
4. **CONTINUITY CHECK OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) black return test lead or three prong receptacle adapter box. This jack is always used when performing a continuity test. Please refer to page 41 for details on connecting the adapter box between Hypot II and the device under test.

5. **POWER SWITCH:** Rocker-style switch with international ON (|) and OFF (0) markings.

6. **SET KEY:** Use this key to advance forward through the setup menus.

7. **DOWN ARROW (∨):** Use this key to decrement numeric values in the setup mode. This key also used to toggle ON/OFF functions. Also may be used to decrease output voltage during a test in 10 volt increments.

FRONT PANEL CONTROLS



8. **UP ARROW (∧):** Use this key to increment numeric values in the setup mode. This key also used to toggle ON/OFF functions. Also may be used to increase output voltage during a test in 10 volt increments.

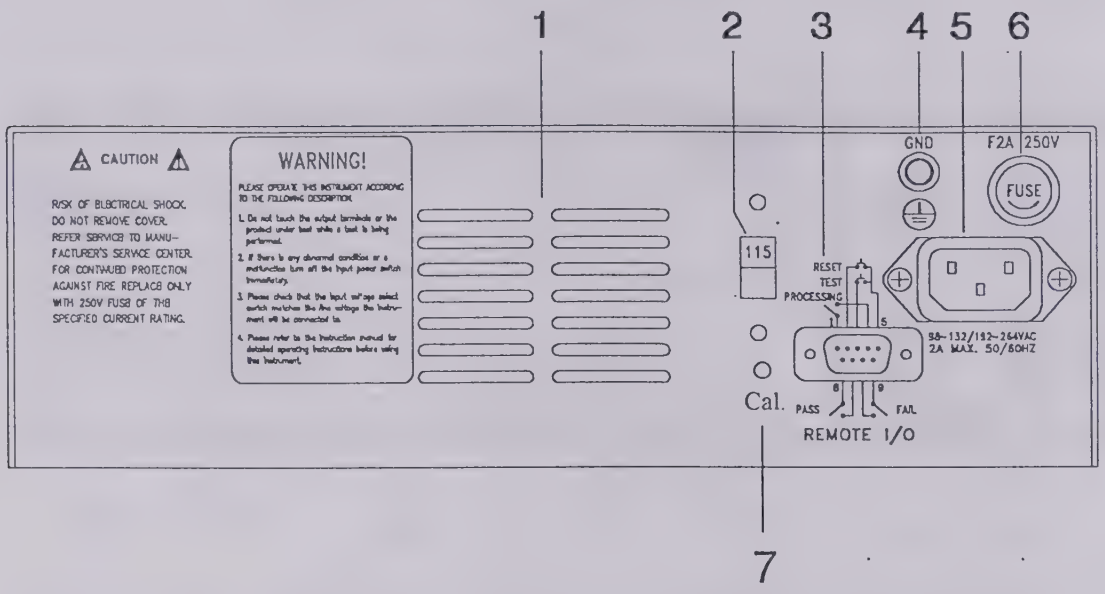
9. **EXIT KEY:** Use this key when you desire to enter the **Run Mode** to initiate a test.

10. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) red high voltage test lead. The silicone rubber insulation is flexible for easy handling and is rated at 30KVDC. The jack is recessed for safety when this lead is not being used.

11. **HIGH VOLTAGE ARROW (LED INDICATOR):** This indicator flashes to warn the operator that high voltage is present at the high voltage output terminal.

12. **RETURN OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) black return test lead. This lead is always used when performing a test.

REAR PANEL CONTROLS


1
2
3
4
5
6
7
CAUTION
RISK OF ELECTRICAL SHOCK. DO NOT REMOVE COVER. REFER SERVICE TO MANUFACTURER'S SERVICE CENTER. FOR CONTINUED PROTECTION AGAINST FIRE REPLACE ONLY WITH 250V FUSE OF THE SPECIFIED CURRENT RATING.
WARNING!
PLEASE OPERATE THIS INSTRUMENT ACCORDING TO THE FOLLOWING DESCRIPTION.
1. Do not touch the output terminals or the product under test while a test is being performed.
2. If there is any abnormal condition or a malfunction turn off the input power switch immediately.
3. Please check that the input voltage select switch matches the Ave voltage the instrument will be connected to.
4. Please refer to the instruction manual for detailed operating instructions before using the instrument.
GND
F2A 250V
FUSE
115
RESET
TEST
PROCESSING
98-132/192-264VAC
2A MAX. 50/60HZ
Cal.
PASS
FAIL
REMOTE I/O

1. **THERMAL FAN:** To cool the instrument.

2. **INPUT POWER SWITCH:** Line voltage selection is set by the position of the switch. In the down position it is set for 115 volt operation, in the up position it is set for 230 volt operation.

3. **REMOTE INPUT/OUTPUT:** 9 pin D subminiature male connector for remote control of test and reset funtions as well as for monitoring PASS, FAIL, and PROCESSING output relay signals.

4. **CHASSIS GROUND (EARTH) TERMINAL:** This safety terminal should be connected to a good earth ground before operation.

5. **INPUT POWER RECEPTACLE:** Standard IEC 320 connector for connection to a standard NEMA style line power (mains) cord.

6. **FUSE RECEPTACLE:** To change the fuse unplug the power (mains) cord and turn the fuse cap counter clockwise to remove the fuse.

7. **CALIBRATION ENABLE KEY:** To enter the calibration mode press this key while the instrument is being powered ON.

INSTALLATION

Introduction

This section contains information for the unpacking, inspection, preparation for use and storage of your Associated Research, Inc., product.

Unpacking and Inspection

Your instrument was shipped in a custom foam insulated container that complies with ASTM D4169-92a Assurance Level II Distribution Cycle 13 Performance Test Sequence.

If the shipping carton is damaged, inspect the contents for visible damage such as dents, scratches or broken meters. If the instrument is damaged, notify the carrier and the Associated Research customer support department immediately. Please save the shipping carton and packing material for the carriers inspection. Our customer support department will assist you in the repair or replacement of your instrument. Please do not return your product without first notifying us and receiving an RMA (return materials authorization) number.

Preparation for Use

Power Requirements and Line Voltage Selection

CAUTION This instrument requires a power source of either 115 volts AC ± 15%, 47-63 Hz single phase or 230 volts AC ±15%, 47-63 Hz single phase. Please check the rear panel to be sure the proper switch setting is selected for your line voltage requirements before turning your instrument on. In addition, please be sure the correct fuse is selected and installed while the instrument is in the off position.

Do not switch the line voltage selector switch located on the rear panel while the instrument is on or operating. This may cause internal damage and represents a safety risk to the operator.

NOTE

For operation at 115 Volts AC and 230 Volts AC use a 3.15A fast acting fuse.

Power Cable

WARNING **BEFORE CONNECTING POWER TO THIS INSTRUMENT, THE PROTECTIVE GROUND (EARTH) TERMINALS OF THIS INSTRUMENT MUST BE CONNECTED TO THE PROTECTIVE CONDUCTOR OF THE LINE (MAINS) POWER CORD. THE MAIN PLUG SHALL ONLY BE INSERTED IN A SOCKET OUTLET (RECEPTACLE) PROVIDED WITH A PROTECTIVE GROUND (EARTH) CONTACT. THIS PROTECTIVE GROUND (EARTH) MUST NOT BE DEFEATED BY THE USE OF AN EXTENSION CORD (POWER CABLE) WITHOUT A PROTECTIVE CONDUCTOR (GROUNDING).**

This instrument is shipped with a three-wire power cable. When this cable is connected to an appropriate AC power source, this cable connects the chassis to earth ground. The type of power cable shipped with each instruments depends on the country of destination.

Operating Environment

This equipment is intended for indoor use only. The equipment has been evaluated according to Installation Category II and Pollution Degree 2 as specified in IEC 664.

This instrument may be operated within the following environmental conditions:
Temperatures from 32° - 113° F (0° - 45° C).
Relative humidity of 0 to 95%.
Altitude up to 15,000 feet (4,600 meters).

STORAGE AND SHIPMENT

Environment

This instument may be stored or shipped in environments with the following limits:

Temperature..... -40° to +75°C
Altitude..... 7,620 meters (25,000 feet)

The instrument should also be protected against temperature extremes which may cause condensation within the instrument.

Packaging

Original Packaging: Please retain all original packaging materials if you do not have an alternate method of repackaging. If you are returning your instrument to us for servicing please repackage the instrument in its original container or use an alternate packaging solution. Please do not reuse the original packing material if there appears to be damage or missing packing material. Contact our customer support department (1-800-858-8378) for an RGA (return goods authorization) number. Please enclose the instrument with all options, accessories and test leads. Indicate the nature of the problem or type of service needed. Also, please mark the container "FRAGILE" to insure proper handling. Upon receipt your instrument will be issued an AR service number. Please refer to this number in all correspondence.

Other Packaging: If you do not have the original packaging materials please follow these guidelines:

1). Wrap the instrument in a bubble pack or similar foam. Enclose the same information as above.

2). Use a strong double-wall container that is made for shipping instrumentation. 350 lb. test material is adequate.

3). Use a layer of shock-absorbing material 70 to 100 mm (3 to 4 inch) thick around all sides of the instrument. Protect the control panel with cardboard.

4). Seal the container securely.

5). Mark the container "FRAGILE" to insure proper handling.

6). Please ship models 3500D, 3505D, 3565D and 3570D via Federal Express or UPS air.

7). Please refer in all correspondence to your AR service number.

Field Installation Of Options

There are no field installable options on the model 3500D, 3505D, 3565D or 3570D.

QUICK START

This quick start guide assumes the operator has some familiarity with automated hipot testing and desires to use the **"default"** settings on the instrument. The default settings shown will remain in memory unless you choose to override them with your own test program. The default settings will appear in memories 1 through 5 for models 3505D, 3565D and 3570D. The instrument default settings are as follows:

DEFAULTS

- **Input Voltage:** 115 or 230 volts AC country specific (rear panel switch selectable)
- **Lock:** OFF
- **Test:** W - I (3570D only)

Dielectric Withstand Test Mode

- **Voltage Output:** 1,240 volts AC
- **High Current Trip:** HI-LMT: 10 mA
- **Low Current Trip:** LO-LMT: 0 mA (3505D and 3565D only)
- **Ramp Timer:** 0 second (3505D 3565D 3570D only)
- **Dwell Timer:** 1 second
- **Voltage Type:** AC
- **AC Output Frequency:** 60Hz
- **Continuity:** OFF

Insulation Resistance Mode (model 3570D only)

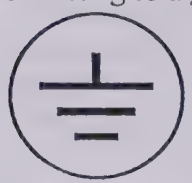
- **Voltage Output:** 1,000 volts DC
- **High Resistance Trip:** I - High: 0 MΩ
- **Low Resistance Trip:** I - Low: 1 MΩ
- **Delay Timer:** 2 seconds

a). Unpack this instrument from its special shipping container. Be sure to save all packaging materials in case you need to return it to the factory for service.

WARNING b). Locate a suitable testing area and be sure you have read all safety instructions for the operation of the instrument and suggestions on the test area set-up in the SAFETY section of this manual. Locate a three prong grounded outlet. Be sure the outlet has been tested for proper wiring before connecting the instrument to it.

CAUTION c). Check to be sure the correct input line voltage has been selected on the rear panel. Either 115 volts AC or 230 volts AC. Connect the power input plug into its socket on the rear panel of the instrument. Connect the male end of the plug to the outlet receptacle.

Please be sure that the safety ground on the power line cord is not defeated and that you are connecting to a grounded power source.



d). Turn on the POWER switch located on the lower left hand side of the front panel. Upon powering the instrument up a POWER ON SELF TEST (POST) will automatically be performed. This test will check for the condition of the ram chips, led indicators, pcb's and other critical components. All of the front panel led's will light temporarily then go out. In addition, you will see the Associated Research name and Model Number briefly appear on the LCD readout and then clear itself.

ARI HYPOT II	
3500D VER [ ]	← Current software version displayed here

You should then see the default parameters on the LCD meter as follows for models 3500D:

SET		1.0S
1.24KVAC		10.00mA

Or these defaults for models 3505D and 3565D:

SET	M1	1.0S
1.24KVAC		10.00mA

Or these defaults for models 3570D. The underbar character after the memory location indicates that an Insulation Resistance test will execute after the Dielectric Withstand test is completed successfully.

W - SET	M1_	1.0S
1.24KVAC		10.00mA

These abbreviated parameters stand for the following:

SET:	This is the parameter settings review screen.
W - SET:	This is the parameter settings review screen for Dielectric Withstand test mode.
M1:	Indicates the memory location of the current settings.
M1_:	Indicates that an Insulation Resistance test will execute after the Dielectric Withstand test is completed successfully. (3570D only)
1.0 S:	The dwell timer is set to a test duration of 1 second.
1.24KVAC:	The test voltage is set to 1,240 volts AC.
10.00 mA:	The high leakage current trip point is set to 10 milliamps.

If you wish to not use any one of these parameters you must change your parameters. Please refer to the Operation Instructions section in this manual for further details.

e). If the instrument defaults are acceptable then be sure to connect the appropriate test leads to the device under test (DUT) or test fixture. Be sure to connect this safety ground to a suitable known good ground before energizing this instrument, Then connect the return lead first (black) to the test fixture or item followed by the high voltage output lead (red).

WARNING f). Please check your connections to be sure they are making good contact and that the test station or area is clear of debris and other personnel. DO NOT TOUCH THE DEVICE UNDER TEST ONCE THE TEST HAS BEEN STARTED. To initiate the test press the GREEN test button on the front panel. This is a momentary button and does not need to be held in the pressed position during the test. The instrument will then cycle ON and begin the automated test sequence using the defaults. If a failure occurs you will HEAR an audible alarm go off. To stop the alarm you must depress the RED button marked RESET. This will silence the alarm and reset the instrument to begin another test. This RESET button may also be used as a safety button to quickly ABORT a test and cut off the HIGH VOLTAGE.

When HIGH VOLTAGE is present a RED flashing indicator located above the HV receptacle will remain flashing until the HIGH VOLTAGE is OFF. If the device under test PASSED the test then no audible alarm will sound. You will hear a brief BEEP to let you know the item was successfully tested and it PASSED. In the case of a FAIL condition the instrument will provide a memory of the test condition results on the LCD display that will remain until the next test is initiated. Depressing the reset button will reset the instrument alarm while keeping the last test results on the display. Depressing the reset button a second time will clear the display.

OPERATION INSTRUCTIONS FOR Hypot II
Model 3500D, 3505D, 3565D and 3570D

A. POWER UP:

CAUTION Check to be sure the correct input line voltage has been selected on the rear panel. Either 115 volts AC or 230 volts AC. Connect the power input plug into its socket on the rear panel of the instrument. Connect the male end of the plug to the outlet receptacle.

Please be sure that the safety ground on the power line cord is not defeated and that you are connecting to a grounded power source. Also connect the rear panel chassis ground for additional safety.

Turn on the POWER switch located on the lower left hand side of the front panel. Upon powering the instrument up a POWER ON SELF TEST (POST) will be automatically performed. This test will check for the condition of the ram chips, pcb's and other critical components. In addition the display will show the following message, with the actual model number displayed in place of *model #* below.

```
   ARI HYPOT II
model #      VER: X.X
```

The instrument will recall the last setup which was active and the display will show the parameters which were programmed into the unit. The instrument is now ready for operation.

B. SETUP PROCEDURE:

1. To select the Memory location on models 3505D, 3565D and 3570D only
Please press the SET key until the display shows

```
Memory  =    X
```

Use the Up/Down arrow keys to select memory locations 1 through 5. After selecting the memory press the SET key to view the settings that have been recalled from memory or to make any changes to these settings.

To store any changes to the settings press the Exit key. The parameters are automatically updated into the memory location that was selected, when exiting to the test mode.

2. To set the test type and sequence for model 3570D only

On model 3570D only the Insulation Resistance (I) and Dielectric Withstand (W) test can be run independently or as a sequence of tests. When "W" or "I" is selected the instrument executes only the test selected. When "W-I" is selected, first the Dielectric Withstand test will execute and then the Insulation Resistance test will execute, selecting "I-W" executes the two tests in the reverse order. To change the Test type on model 3570D only, please press the SET key until the display shows:

Test = W	or	Test = I	or	
Test = W- I	or	Test = I-W		

Press the Up or Down Arrow keys to toggle the test selection; then press the EXIT key to exit to the test mode or toggle to another setting using the SET key.

Note: The Test mode type will effect the number of items displayed in the menu. The menu will display only the items that are relative to the Test mode that has been selected.

3. To set the AC / DC mode for models 3565D and 3570D only

Press the SET key until the display shows:

Models 3565D

Mode = AC	or	Mode = DC

Model 3570D

W-Mode = AC	or	W-Mode = DC

Press the Up or Down Arrow keys to toggle the output function; AC or DC, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key.

4. To set the Output Test Voltage

Please press the SET key until the display shows:

Models 3500D, 3505D, 3565D		Model 3570D
Voltage = X.XX KV	or	W-Volt = X.XX KV

Please use the Up/Down Arrow keys to enter the desired test voltage, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key. The maximum voltage which may be entered is 5000 volts AC or 6000 volts DC.

5. To set the High Leakage Current Limit
Please press the SET key until the display shows:

Models 3500D, 3505D, and 3565D		Model 3570D
HI-LMT= XX.XX mA	or	W-High = XX.XX mA

Use the Up/Down Arrow keys to enter the leakage current high limit setting, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key. The unit of measure is in milliamperes with 0.10 AC and 0.02 DC milliamperes as the minimum setting.

6. To set the Low Leakage Current Limit on models 3505D, 3565D and 3570D only
Please press the SET key until the display shows:

Models 3505D, 3565D		Model 3570D
LO-LMT= XX.XX mA	or	W-Low = XX.XX mA

Use the Up/Down Arrow keys to enter the leakage current low limit setting, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key. The unit of measure is in milliamperes with 0.00 milliamperes AC and DC as the minimum setting.

7. To set the Ramp Time on models 3505D, 3565D and 3570D only
Please press the SET key until the display shows:

Models 3505D, 3565D		Model 3570D
Ramp-T = XXX.X s	or	W-Ramp = XXX.X s

Use the Up/Down Arrow keys to enter the ramp time setting, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key. If the ramp time is set to "0", the instrument will raise the voltage up to the test voltage in a fixed ramp time of 0.1 seconds AC and DC and then begin the dwell cycle. The minimum ramp time setting is 0.2 seconds with 0.1 second resolution.

8. To set the Dwell Time
Please press the SET key until the display shows:

Models 3500D, 3505D, and 3565D		Model 3570D
Timer = XXX.X s	or	W-Dwell = XXX.X s

Use the Up/Down Arrow keys to enter the dwell time setting, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key. If the dwell time is set to "0", the instrument will operate in a continuous ON mode when the test button is depressed and released. It will stop when the DUT (Device Under Test) goes into failure or the manual reset button is pressed. The minimum dwell time setting is 0.2 seconds with 0.1 second resolution.

9. To setup the Ground Continuity Check
Please press the SET key until the display shows:

Models 3500D, 3505D, and 3565D

Continuity = ON	or	Continuity = OFF

Model 3570D

W-Continuity = ON	or	W-Continuity = OFF

Press the Up/Down Arrow key to select the "ON" or "OFF" function of the Ground Continuity Check mode, the display will show the set status immediately.
Press the EXIT key to exit to the test mode or toggle to another setting using the SET key.

If the Continuity Function is set to "ON," the Ground Continuity cable has to be connected between the "Cont. Check" connector on the instrument panel and the chassis of the DUT. The instrument will test the ground connection of the DUT automatically. If continuity is present a green indicator will be illuminated on the TEST switch and the operator may proceed with the hipot test. The Hypot II will continue to test the ground connection of the DUT during other tests. If no continuity is present while the operator tries to initiate a test, the instrument will signal a continuity failure.

10. To set the Frequency 50/60 Hz
Please press the SET key until the display shows:

Models 3500D, 3505D, and 3565D

Freq = 50 HZ	or	Freq = 60 HZ

Model 3570D

W-Freq = 50 HZ	or	W-Freq = 60 HZ

Press the Up or Down Arrow keys to toggle the frequency selection; 50 or 60 hertz, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key.

11. To Set Key Lock or Memory Lock

The Hypot II is equipped with two different lockout selections. The first selection is Key Lock. Within this selection, you can lockout all front panel control functions except TEST and RESET. The second selection is Memory Lock and is used in conjunction with the Key Lock. Within this selection, you can lockout all front panel control functions except TEST, RESET and memory select.

You can toggle this selection only from a power OFF state. Please turn the POWER switch to the off position then press and hold the SET key, then turn the power ON. Momentarily you will see one of the following screens to indicate if the keys are locked or unlocked:

Key Lock = ON	or	Key Lock = OFF

To toggle the Key Lock function on and off use the Up or Down Arrow keys, then press EXIT to select, or press the SET key again to reach the Memory Lock screens.

The memory lock screens appear as follows:

Memory Lock = ON	or	Memory Lock = OFF

To toggle the Memory Lock function on and off use the Up or Down Arrow keys, then press EXIT to select, or press the SET key again to reach the Key Lock screens.

Use the following chart to set the Key Lock and Memory Lock for your application.

Key Lock	Memory Lock	Accessible keys
Off	Off	All
Off	On	All
On	Off	TEST, RESET, and Up-Down Arrows for memory selection
On	On	TEST and RESET

12 To set the IR output Test Voltage on model 3570D only

Please press the SET key until the display shows:

I-Volt = X.XX KV

Please use the Up/Down Arrow keys to enter the desired test voltage, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key. The maximum voltage which may be entered is 1.00 kilovolts DC.

13. To set the High Resistance Limit on model 3570D only
Please press the SET key until the display shows:

I-High = XXXX MΩ

Use the Up/Down Arrow keys to enter the resistance high limit setting, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key. The unit of measure is in megohms with 0 - 1000 MΩ range of setting. A setting of 0 MΩ disables the high limit setting. A measured value above the High Limit setting will result in a failure condition at the end of the Delay time setting.

14. To set the Low Resistance Limit on model 3570D only
Please press the SET key until the display shows:

I-Low = XXXX MΩ

Use the Up/Down Arrow keys to enter the resistance low limit setting, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key. The unit of measure is in megohms with 1 - 1000 MΩ range of setting. A measured value below the Low Limit setting will result in a failure condition at the end of the Delay time setting.

15. To set the Delay Time on model 3570D only
Please press the SET key until the display shows:

I-Delay = XXX.X s

Use the Up/Down Arrow keys to enter the delay time setting, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key.

If the delay time is set to "0", the instrument will operate in a continuous ON mode when the test button is pressed and released. The test will stop only when the manual reset button is pressed to abort the Test. The minimum delay time setting is 0.5 seconds with 0.1 second resolution.

Note: The Delay timer in the IR mode differs from the Dwell timer in the Hipot mode. A judgment is not made until the Delay time has elapsed. In the Hipot mode a Pass / Fail judgment is made a soon as the leakage limits are exceeded. Therefore when the Delay time is set to zero Pass and Fail judgment or indications will not be made.

C. OPERATING PROCEDURES:

1. If the instruments defaults are acceptable then be sure to connect the appropriate test leads to the device under test (DUT) or test fixture. Be sure to connect the safety ground (on the rear panel) to a suitable known good ground before energizing this instrument. Then connect the return lead first to the test fixture or the DUT followed by the high voltage lead.

Check your connections to be sure they are making good contact and that the test station or area is clear of debris or other personnel. **DO NOT TOUCH THE DEVICE UNDER TEST ONCE THE TEST HAS BEEN STARTED.**

WARNING 2. Please follow the setup procedures to set the parameters. The display will show the Dwell or Delay Timer value, the Test Voltage value, and the High Limit Setting. On model 3505D, 3565D and 3570D the memory location will also be displayed.

models 3500D

```
Set                 XXX.Xs
X.XXKVAC            XX.XXmA
```

or

models 3505D and 3565D

```
Set          MX     XXX.Xs
X.XXKVAC            XX.XXmA
```

On model 3570D the display will show either the Dielectric Withstand test stettings or the Insulation Resistance test settings depending on what has been selected, as follows:

model 3570D

```
W-Set        MX     XXX.Xs
X.XXKVAC            XX.XXmA
```

or

```
I-Set        MX     XXX.Xs
X.XXKVDC            XXX.XMΩ
```

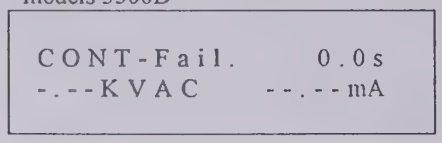
On model 3570D the underbar character may be displayed after the memory number (i.e. M5_) this indicates that there is another configured test that will execute after the displayed setup has completed successfully. To view the second test setup, press the down arrow key. Return to the first test by pressing the up arrow key. If a second test is not configured an audible beep will be heard when the arrow keys are pressed.

Dielectric Withstand Test Mode

3. If you are performing a Ground Continuity Check the Ground Continuity must be set to the "ON (Enabled)" position. The ground check cable has to be connected properly to the chassis of the DUT and the green indicator on the TEST switch should be illuminated before activating the Test switch. Otherwise, the instrument will signal a *continuity failure* when the test switch is activated. Please refer to page 41 for the proper test connections using the adapter box, to test items terminated in a three prong plug.

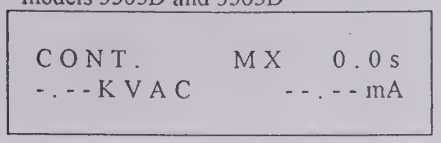
The display will show:

models 3500D

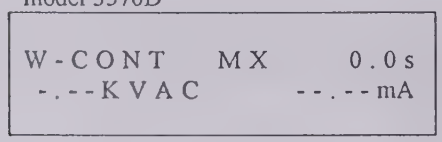


or

models 3505D and 3565D



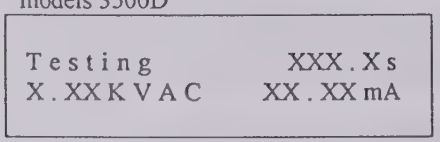
model 3570D



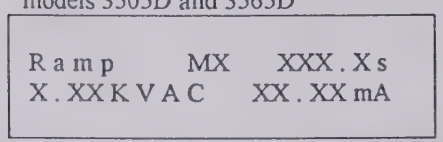
If you are not performing a Ground Continuity Check the Ground Continuity must be set to the "OFF" (Disabled) position. It is not necessary to connect the "Cont.Check" cable since this test will not be performed if the circuit is disabled. The instrument will proceed with the Hipot Test when the "Test" switch is activated.

4. To initiate a test, press the TEST switch on the front panel. The red High Voltage Arrow indicator will flash and the display will immediately show:

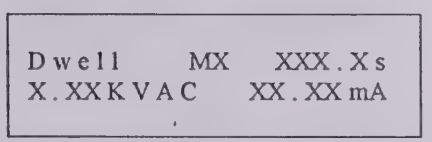
models 3500D



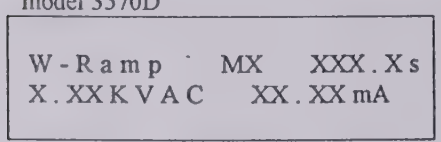
models 3505D and 3565D



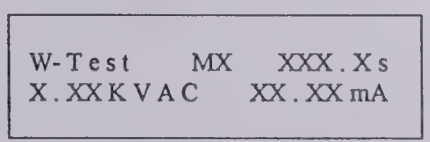
or



model 3570D



or



The instrument will continue to output the desired voltage for the duration of the selected dwell time for model 3500D or selected Ramp and Dwell times on model 3505D, 3565D and 3570D.

5. If there is a short circuit in the DUT during the test, the red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

models 3500D

```
HI-FAIL          XXX.Xs
X.XXKVAC         OFL mA
```

or

models 3505D and 3565D

```
HI-FAIL  MX      XXX.Xs
X.XXKVAC         OFL mA
```

model 3570D

```
W-High   MX      XXX.Xs
X.XXKVAC         OFL mA
```

6. If a flash over occurs in the DUT during the test, which results in an OFL condition due to the current exceeding the maximum metering range, Breakdown will be indicated as follows. The red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

models 3500D

```
HI-FAIL          XXX.Xs
X.XXKVAC         OFL mA
```

or

models 3505D and 3565D

```
HI-FAIL  MX      XXX.Xs
X.XXKVAC         OFL mA
```

model 3570D

```
W-High   MX      XXX.Xs
X.XXKVAC         OFL mA
```

7. If the leakage current exceeds the metering range and neither a short circuit nor flash over occurred, the red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

models 3500D

```
HI-FAIL          XXX.Xs
X.XXKVAC         OFL mA
```

or

models 3505D and 3565D

```
HI-FAIL  MX      XXX.Xs
X.XXKVAC         OFL mA
```

model 3570D

```
W-High   MX      XXX.Xs
X.XXKVAC         OFL mA
```

8. If the leakage current exceeds the high limit setting, but does not exceed the metering range, the red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

models 3500D

```
HI-FAIL          XXX.Xs
X.XXKVAC         XX.XXmA
```

or

models 3505D and 3565D

```
HI-FAIL  MX      XXX.Xs
X.XXKVAC         XX.XXmA
```

model 3570D

```
W-High   MX      XXX.Xs
X.XXKVAC         XX.XXmA
```

9. If the leakage current does not exceed the low limit setting on model 3505D, 3565D and 3570D, the red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

models 3505D and 3565D

```
LO-LMT   MX      XXX.Xs
X.XXKVAC         XX.XXmA
```

or

model 3570D

```
W-Low    MX      XXX.Xs
X.XXKVAC         XX.XXmA
```

10. To stop the alarm, please press the RESET switch once. The alarm will stop and the display will retain the failure information. If the RESET switch is pressed again, the data on the display screen will be cleared and the display will indicate the setting data from the last test. The instrument is now ready for the next test.

11. If the DUT passed the test, the instrument will output a short audible beep tone to indicate the DUT has passed the test. The display will show:

models 3500D

```
Pass             XXX.Xs
X.XXKVAC         XX.XXmA
```

or

models 3505D and 3565D

```
Pass     MX      XXX.Xs
X.XXKVAC         XX.XXmA
```

model 3570D

```
W-Pass   MX      XXX.Xs
X.XXKVAC         XX.XXmA
```

The instrument is now ready to perform another test.

12. If the operator elects to abort a test in process this can be accomplished by pressing the RESET switch at anytime. The instrument will stop the test process immediately and the display will show:

models 3500D

```
Abort              XXX.Xs
X.XXKVAC        XX.XXmA
```

or

models 3505D and 3565D

```
Abort      MX      XXX.Xs
X.XXKVAC        XX.XXmA
```

model 3570D

```
W-ABRT     MX     XXX.Xs
X.XXKVAC        XX.XXmA
```

Please press the TEST switch to initiate another test.

Insulation Resistance Test Mode model 3570D only

13. To initiate a test press the TEST switch on the front panel. The red High Voltage Arrow indicator will flash and the display will immediately show:

```
I-Test     MX   XXX.Xs
X.XXKVDC     XXX.XMΩ
```

14. If the DUT passed the test, the instrument will output a short audible beep tone to indicate the DUT has passed the test. The display will show:

```
I-Pass     MX     XXX.Xs
X.XXKVDC     XXX.XMΩ
```

15. If the operator elects to abort a test in process this can be accomplished by pressing the RESET switch at anytime. The instrument will stop the test process immediately and the display will show:

```
I-ABRT     MX     XXX.Xs
X.XXKVDC     XXX.XMΩ
```

16. If the insulation resistance exceeds the high limit setting, but does not exceed the metering range, the red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

```
I-High      MX  XXX.Xs
X.XXKVDC    XXX.XMΩ
```

17. If the insulation resistance exceeds the high limit setting, and exceeds the metering range, the red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

```
I-High      MX  XXX.Xs
X.XXKVDC    >1000MΩ
```

18. If the leakage current does not exceed the low limit setting and is within the metering range the red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

```
I-Low       MX      XXX.Xs
X.XXKVDC    XXX.XMΩ
```

19. If the leakage current does not exceed the low limit setting and is not within the metering range the red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

```
I-Low       MX      XXX.Xs
X.XXKVDC    <1MΩ
```

D. CONNECTION OF REMOTE I/O:

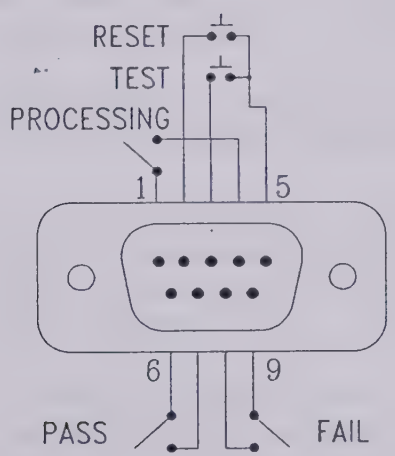
A 9 pin "D" type connector is mounted on the rear panel which provides REMOTE-INPUT-OUTPUT control and information. This connector mates with standard 9 pin "D" subminiature connector provided by the user. The Remote I/O mates to a female (receptacle) connector. For best performance a shielded cable should be used. To avoid ground loops the shield should not be grounded at both ends of the cable. Suggested AMP part numbers for interconnecting to the Remote I/O are shown below.

205203-3	RECEPTACLE SHELL
745253-7	CRIMP SNAP-IN SOCKET CONTACT (for receptacle)
745171-1	SHIELDED CABLE CLAMP (for either plug or receptacle)
747784-3	JACKSCREW SET (2)

REMOTE INTERFACE REAR PANEL:

1. SIGNAL OUTPUTS ON REMOTE I/O

The rear panel connector provides output signals to remotely monitor PASS, FAIL,



REMOTE I/O

and PROCESSING conditions. These signals are provided by three normally open internal relays that switch on to indicate the current condition of the tester. These are normally open free contacts and will not provide any voltage or current. The ratings of the contacts are 1A / 250 VAC (0.5 ADC). Below is a listing that indicates what conditions activate each pin. When a terminal becomes active the relay closes thereby allowing the external voltage to operate an external device.

Pins 6 and 7 provide the PASS signal.
Pins 8 and 9 provide the FAIL signal.
Pins 1 and 4 provide the PROCESSING signal.

The following describes how the relays operate for each test condition.

PROCESSING - The relay contact closes the connection between pin (1) and pin (4) while the instrument is performing a test. The connection is opened at the end of the test.

PASS - The relay contact closes the connection between pin (6) and pin (7) after detecting that the item under test passed all tests. The connection is opened when the next test is initiated or the reset function is activated.

FAIL - The relay contact closes the connection between pin (8) and pin (9) after detecting that the item under test failed any test. The connection is opened when the next test is initiated or the reset function activated.

2. SIGNAL INPUTS OF REMOTE I/O

The Hypot II remote connector enables remote operation of the TEST and RESET functions. A normally open momentary switch can then be wired across pins 3 and 5 to allow remote operation of the TEST function. A normally open momentary switch can also be wired across pins 2 and 5 which allows remote operation of the RESET function. For safety the front panel RESET switch remains active even when a remote reset switch is connected so that high voltage can be shut down from either location.

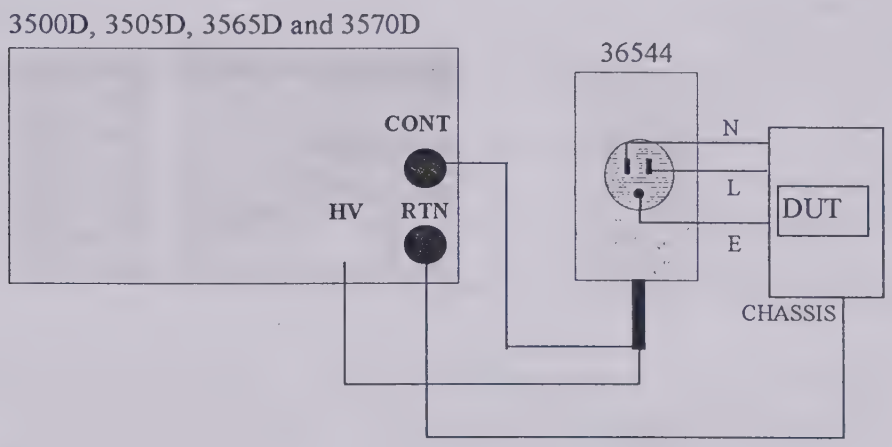
DO NOT CONNECT VOLTAGE OR CURRENT TO THE SIGNAL INPUTS, THIS COULD RESULT IN DAMAGE TO THE CONTROL CIRCUITRY.

CAUTION

E. ADAPTER BOX CONNECTION:

The following diagram shows how to connect the adapter box to the HYPOT II and to the device under test.

The adapter box allows you an easy way to connect an item which is terminated in a two or three prong line cord. If you are testing a product which is terminated in a three prong



Test Connections

plug, you are also required to perform a continuity or ground bond test on the ground conductor of the DUT to the chassis or dead metal of the product. With the HYPOT II, you can perform both the hipot and continuity tests at the same time by activating the continuity function on the instrument.

When the HYPOT II tests the ground conductor of the line cord, if the resistance of the ground conductor exceeds 1Ω, the hipot will signal a continuity failure. If continuity is present, high voltage is applied to both conductors of the line cord to insure that all current carrying conductors in the primary circuit are tested. When testing products with two prong plugs, do not activate the continuity circuit.

MODEL 3500D, 3505D, 3565D and 3570D OPTIONS

Introduction

This section contains a list and descriptions of available factory installed options at the time of this printing. The list of options contains an option code number which can be referenced on the model option label on the rear panel of the unit when options are present.

Model Option Label

On the rear panel of the instrument you will find a label that contains the option code.

For example, your options code would appear as follows:
fitted with option 01.....OPT: 01
fitted with option 01 and 03.....OPT: 0103

3500D, 3505D, 3565D and 3570D Options

Option List

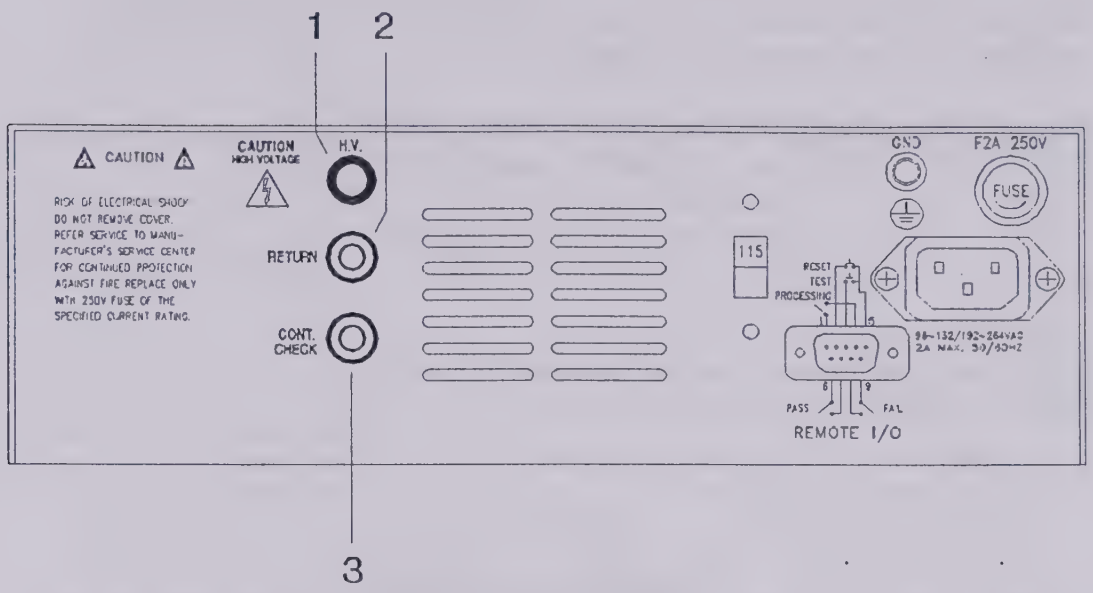
Code	Description
01	Rear Outputs
03	Remote Interlock
04	Arc Detection

Description

01 Rear Outputs

The Rear Outputs option gives the user the capability to access the High Voltage, Return and Continuity outputs from the rear panel for use in automated systems. The configuration and descriptions are as follows.

OPTIONAL REAR PANEL CONTROLS



1. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) red high voltage test lead. The silicone rubber insulation is flexible for easy handling and is rated at 30KVDC. The jack is recessed for safety when this lead is not being used.

2. **RETURN OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) black return test lead. This lead is always used when performing a test.

3. **CONTINUITY CHECK OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) return test lead. This lead is always used when performing a continuity test.

03 Remote Interlock

Option 03 is a Remote Interlock feature that inverts the present reset logic on the instrument from normally opened (must close contacts to activate the reset) to normally closed (must open contacts to activate the reset). Hardware and software have been reconfigured to provide the interlock connections on pins 2 and 5 of the Remote Interface Signal Input port. This reset scheme is designed for use with an external safety interlock device that utilizes a "Fail-When-Open" configuration on its output interface. The instrument can still be used without the external reset device as long as the Interlock Connector 38037 (provided with unit) is plugged into the Remote Interface Signal Input port. If there is nothing connected to the Remote Interface Signal Input port, to provide a connection to the interlock (reset), then the instrument will not function. Please refer to page 38 for further information about the remote interface.

04 Arc Detection

This option provides the user with the capability of detecting low level arcing. The arc detection circuit has nine preset sensitivity levels.

The specifications for the Arc Detection option are as follows:

FAILURE SETTINGS	Arc for AC and DC mode (Option 04 only) Sensitivity range : 1-9 Arc detection : minimum duration ≤ 10μs

SETUP PROCEDURE

1. To activate Arc Detection and set the sensitivity level.

Please press the SET key until the display shows:

```
Arc-Sen =      X
```

Use the Up/Down Arrow keys to select the arc sensitivity level. The arc sensitivity level may be set between the values of 1 and 9, 1 being the least sensitive, 9 being the most sensitive. To deactivate the Arc Detection set the arc sensitivity to 0. Press the EXIT key to exit to the test mode or toggle to another setting using the SET key.

OPERATION PROCEDURE

1. If there is an arcing condition over the Arc sensitivity limit, the red indicator light will illuminate on the reset switch and an alarm sound. The display will show:

models 3500D

```
Arc-Fail        XXX.Xs
X.XXKVAC        XX.XX mA
```

or

models 3505D and 3565D

```
Arc        MX   XXX.Xs
X.XXKVAC        XX.XX mA
```

model 3570D

```
Arc        MX   XXX.Xs
X.XXKVAC        XX.XX mA
```

SECTION 2
SERVICE MANUAL

CALIBRATION PROCEDURES

This instrument has been fully calibrated at the factory in accordance to our published specifications. It has been calibrated with standards traceable to NIST. You will find in this manual a copy of the "Certificate of Calibration". It is recommended that you have this instrument recalibrated and a safety check done at least once per year. AR recommends you use "Calibration Standards" that are NIST traceable, or traceable to agencies recognized by NIST to keep this instrument within published specifications. End user metrology standards or practices may vary. These metrology standards determine the measurement uncertainty ratio of the calibration standards being used.

Calibration Equipment Required:
The following equipment will be needed to properly calibrate your instrument.

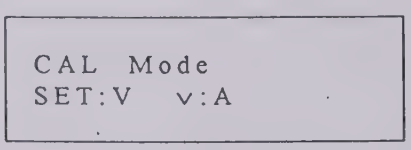
1). Digital Multimeter with the minimum ranges;
AC Voltage: 5,000 volts
AC Current: 25mA range.
DC Current: 2000uA range

2). 500KΩ/50Watt resistor

CALIBRATION PROCEDURE:

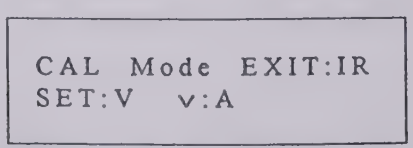
Model 3500D, 3505D and 3565D
To enter the calibration mode the instrument must be in the OFF position. Using a pen or small screw driver, press and hold the recessed calibration key on the rear panel, then turn on the Input Power Switch.

For model 3500D, 3505D and 3565D the display will show:



Press the SET key for kilovolts calibration, Down Arrow key (v) for milliamps.

For model 3570D the display will show:



Press the SET key for kilovolts calibration, Down Arrow key (v) for milliamps, and the EXIT key for insulation resistance calibration.

1. Calibration of Voltage

Equipment needed: STANDARD AC VOLTMETER capable of measuring 5000VAC.

Please connect a standard ac voltmeter with 5000V minimum full scale range to the high voltage and return connectors.
Then press the SET key on the front panel. The instrument will provide around 5000VAC on the output connectors and the display will show:

Voltage =__ V

Please use the Up/Down Arrow keys to enter the reading off the AC Voltmeter into the instrument. Then press the SET key to store the voltage setting. Press the EXIT or RESET key to return to the calibration menu without changing the calibration setting.

The instrument will output two short "beeps" when attempting to save a missing or bad parameter and will not allow return to the calibration menu.

2. Calibration of Dielectric Withstand Current

Equipment needed: STANDARD AC MILLIAMMETER with a range of 25mA and a fixed Resistor 500K Ohms, 50 watts.

Please connect a 500KΩ resistor in series with the standard ac milliammeter and connect these across the output leads of the instrument. Press the Down Arrow key. The instrument will provide around 5000VAC on the output and the display will show:

Current =__ mA

Please use the Up/Down Arrow keys to enter the reading of the standard AC milliammeter into the instrument. Then press the SET key to store the current setting. Press the EXIT or RESET key to return to the calibration menu without changing the calibration setting.

The instrument will output two short "beeps" when attempting to save a missing or bad parameter and will not allow return to the calibration menu.

3. Calibration of Insulation Resistance Current model 3570D only

Equipment needed: STANDARD DC MILLIAMMETER with a range of 2000uA and a fixed Resistor 500K Ohms, 50 watts.

Please connect a 500KΩ resistor in series with the standard DC microammeter and connect these across the output leads of the instrument. Press the EXIT key. The instrument will provide around 500VDC on the output and the display will show:

Current =__ uA

Please use the Up/Down Arrow keys to enter the reading of the standard DC microammeter into the instrument. Then press the SET key to store the current setting. Press the EXIT or RESET key to return to the calibration menu without changing the calibration setting.

The instrument will output two short "beeps" when attempting to save a missing or bad parameter and will not allow return to the calibration menu.

4. Save Calibration

After the calibration, the instrument has to be turned off to save the calibration parameters. The power must be turned off and on again to switch from the calibration mode to the run mode.

Replacement Parts List HYPOT II

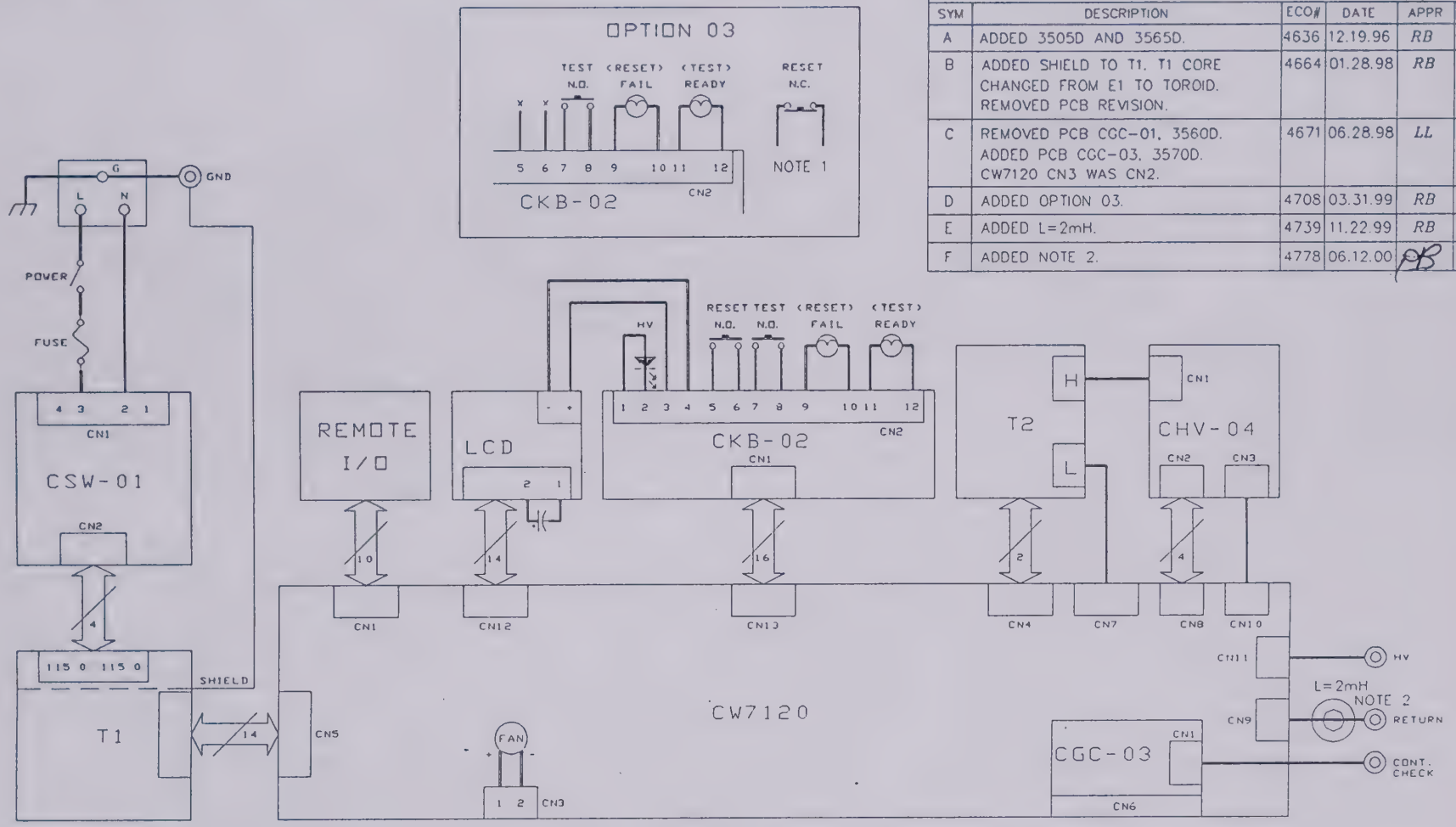
Model 3500D, 3505D, 3565D and 3570D

Rev I. ECO 4671

Part Number	Qty.	Reference Designator	Description
37961	1	CGC-03	Ground Continuity Board (3500 - 3565D only)
37903	1	CGC-03	Ground Continuity Board (3570D only)
37590	1	CHV-04	High Voltage Control Board (3565D, 3570D)
37593	1	CKB-02	Key Board Assembly
37515	1	CSW-01	Input Protection Board
37917	1	CW7120	Main Control Board
37571	1	-	Earth Connector
35999	4	-	Black Banana Jacks
37478	2	-	High Voltage Connector
37599	1	-	Feet kit
37880	1	-	Fuse 3.15A, 250V, Fast Acting, 5x20mm
37781	1	-	Fuse Holder 20mm
37554	1	-	LCD Display 16 x 2 Characters
37555	1	-	Power Switch 2P 10A/250V
37673	1	-	Test Switch, Green
37497	1	-	Reset Switch, Red
37601	1	T2	Output High Voltage Transformer
37900	1	T1	Input Transformer
33189	1	-	Input Power Cable 10A/7Ft.
04040A-08	1	-	High Voltage Output cable
02100A-13	2	-	Return cable
37487	3	Q1-Q3	Power Transisitors D1148
37784	1	RY2	Relay Gunther 3392-1290-246
37603	1	IC29	12 Bit D/A Converter 7541
37697	1	IC36	Microcontroller 8 Bit P89C52
37569	1	IC11	8 Bit D/A Converter DAC 0800
37783	1	RY1	Relay Gunther 3390-1290-246
37605	2	FAIL,READY	Bulbs

SCHEMATIC INDEX

Drawing Number	Description	Pages
S03500D	Wiring Diagram	1
S37917	Main Control Board	5
S37961	Ground Continuity Check Board	1
S37903	Ground Continuity Check Board w/IR test	1
S37590	HV Control Board AC/DC	1
S37593	Keypad Board	1
S37515	Input Protection Board	1
S38220	ROM Conversion Board	1



REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK
A	ADDED 3505D AND 3565D.	4636	12.19.96	RB	NLT
B	ADDED SHIELD TO T1. T1 CORE CHANGED FROM E1 TO TOROID. REMOVED PCB REVISION.	4664	01.28.98	RB	NLT
C	REMOVED PCB CGC-01, 3560D. ADDED PCB CGC-03, 3570D. CW7120 CN3 WAS CN2.	4671	06.28.98	LL	NLT
D	ADDED OPTION 03.	4708	03.31.99	RB	DE
E	ADDED L=2mH.	4739	11.22.99	RB	LL
F	ADDED NOTE 2.	4778	06.12.00	RB	LL

NOTES
1. NORMALLY CLOSED RESET WIRES CONNECT AT MAIN CONTROL BOARD CW7120 (SEE PAGE 5, C2).
2. L2=2mH USED ON MODEL 3570D ONLY.

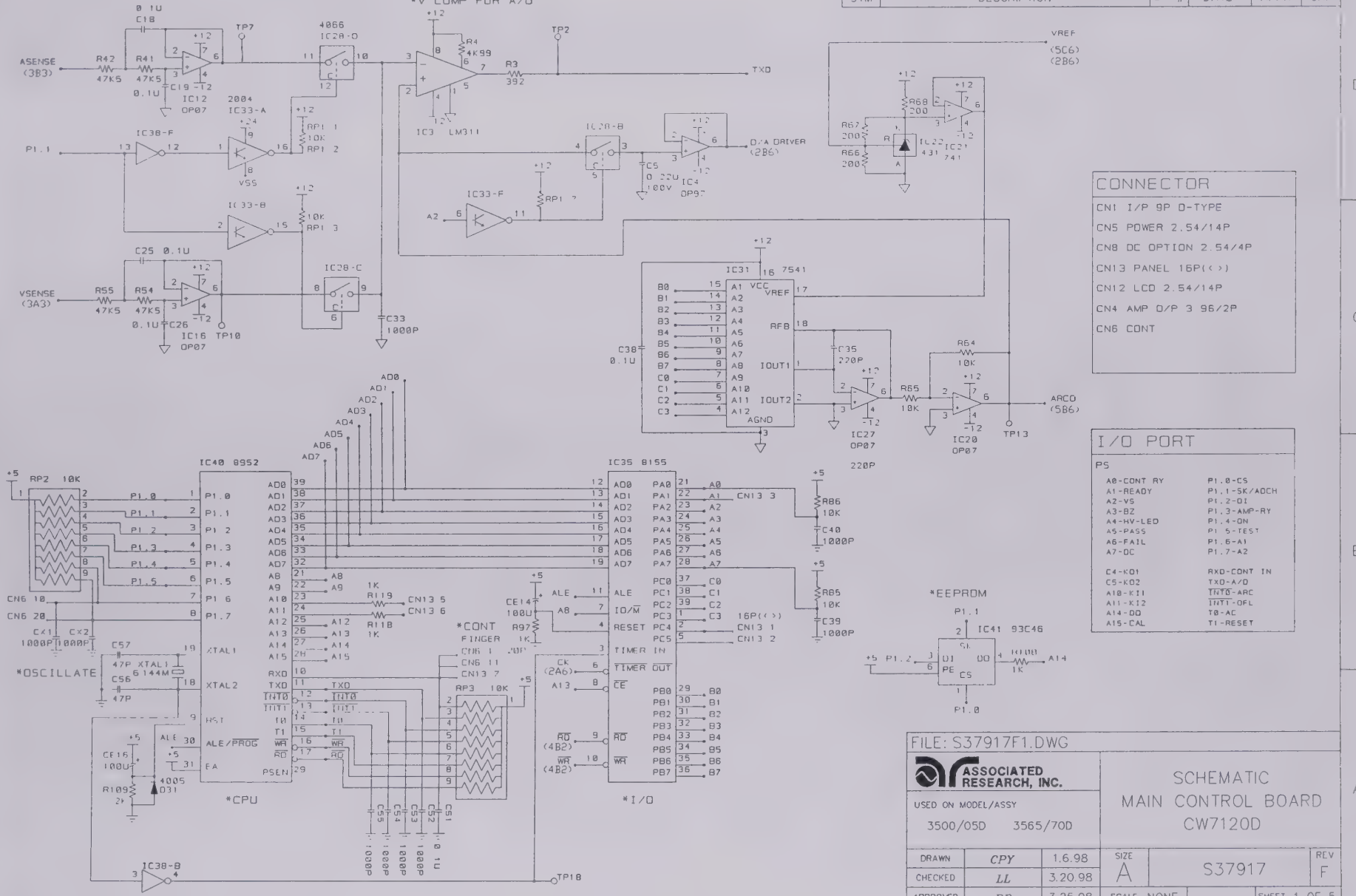
FILE: S3500DF.DWG

ASSOCIATED RESEARCH, INC.

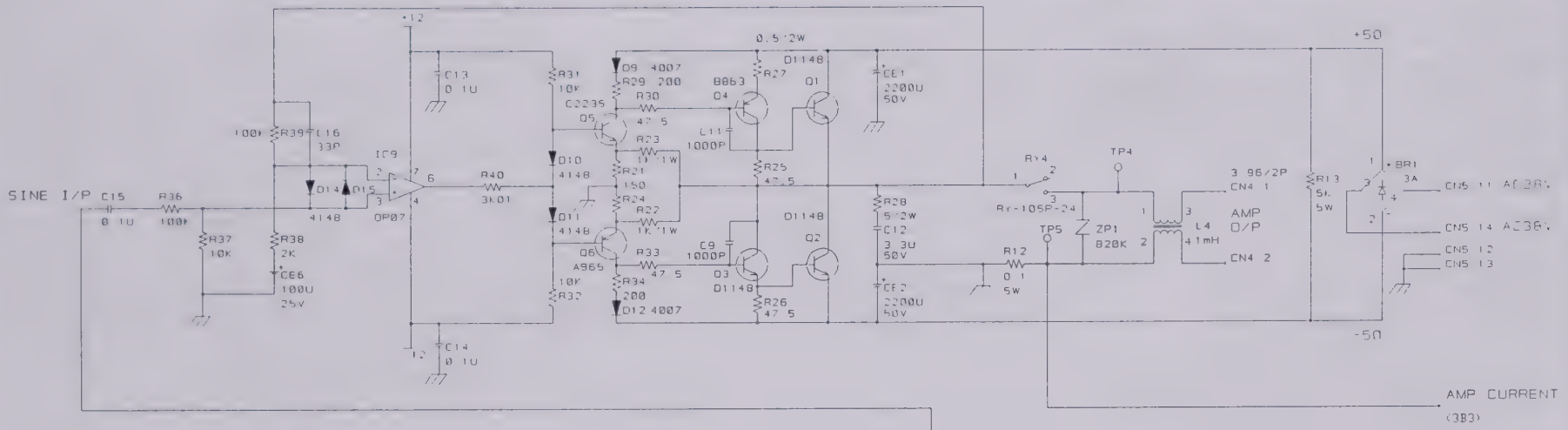
USED ON MODEL/ASSY
3500D 3505D 3565D 3570D

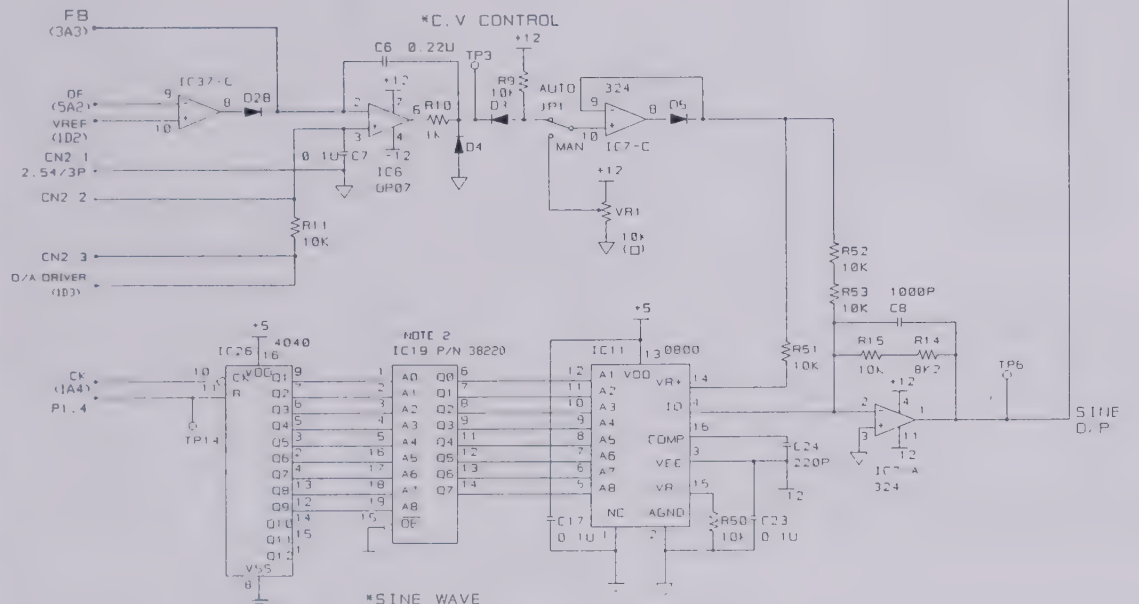
SCHEMATIC
3500/05D / 3565/70D
WIRING DIAGRAM

DRAWN	CPY	11.06.84	SIZE A	S03500D	REV F
CHECKED	NLT	11.15.95			
APPROVED	RB	11.15.95	SCALE NONE		SHEET 1 OF 1


REVISIONS
SYM | DESCRIPTION | ECO# | DATE | APPR | CHK
*V COMP FOR A/D
*CPU
*I/O
*EEPROM
*OSCILLATE
*CONT FINGER
CONNECTOR
CN1 I/P 9P D-TYPE
CN5 POWER 2.54/14P
CN8 DC OPTION 2.54/4P
CN13 PANEL 16P(< >)
CN12 LCD 2.54/14P
CN4 AMP O/P 3 96/2P
CN6 CONT
I/O PORT
PS
A0-CONT RY
A1-READY
A2-VS
A3-BZ
A4-HV-LED
A5-PASS
A6-FAIL
A7-OC
C4-KO1
C5-KO2
A10-KI1
A11-KI2
A14-DO
A15-CAL
P1.0-CS
P1.1-SK/ADCH
P1.2-DI
P1.3-AMP-RY
P1.4-ON
P1.5-TEST
P1.6-A1
P1.7-A2
RXD-CONT IN
TXD-A/D
INT0-ARC
INT1-OFL
T0-AC
T1-RESET
FILE: S37917F1.DWG
ASSOCIATED RESEARCH, INC.
USED ON MODEL/ASSY
3500/05D 3565/70D
SCHEMATIC
MAIN CONTROL BOARD
CW7120D
DRAWN CPY 1.6.98
CHECKED LL 3.20.98
APPROVED RB 3.25.98
SIZE A
S37917
REV F
SCALE NONE
SHEET 1 OF 5

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK





CONVERSION TABLE

SIGNAL	IC19	IC 27512 ON PCB 82147 P/N 38220
A0	1	10
A1	2	9
A2	3	8
A3	4	7
A4	5	6
A5	16	5
A6	17	4
A7	18	3
A8	19	25
GND	15	1, 2, 20-24, 26, 27
O0	6	11
O1	7	12
O2	8	13
O3	9	15
O4	11	16
O5	12	17
O6	13	18
O7	14	19

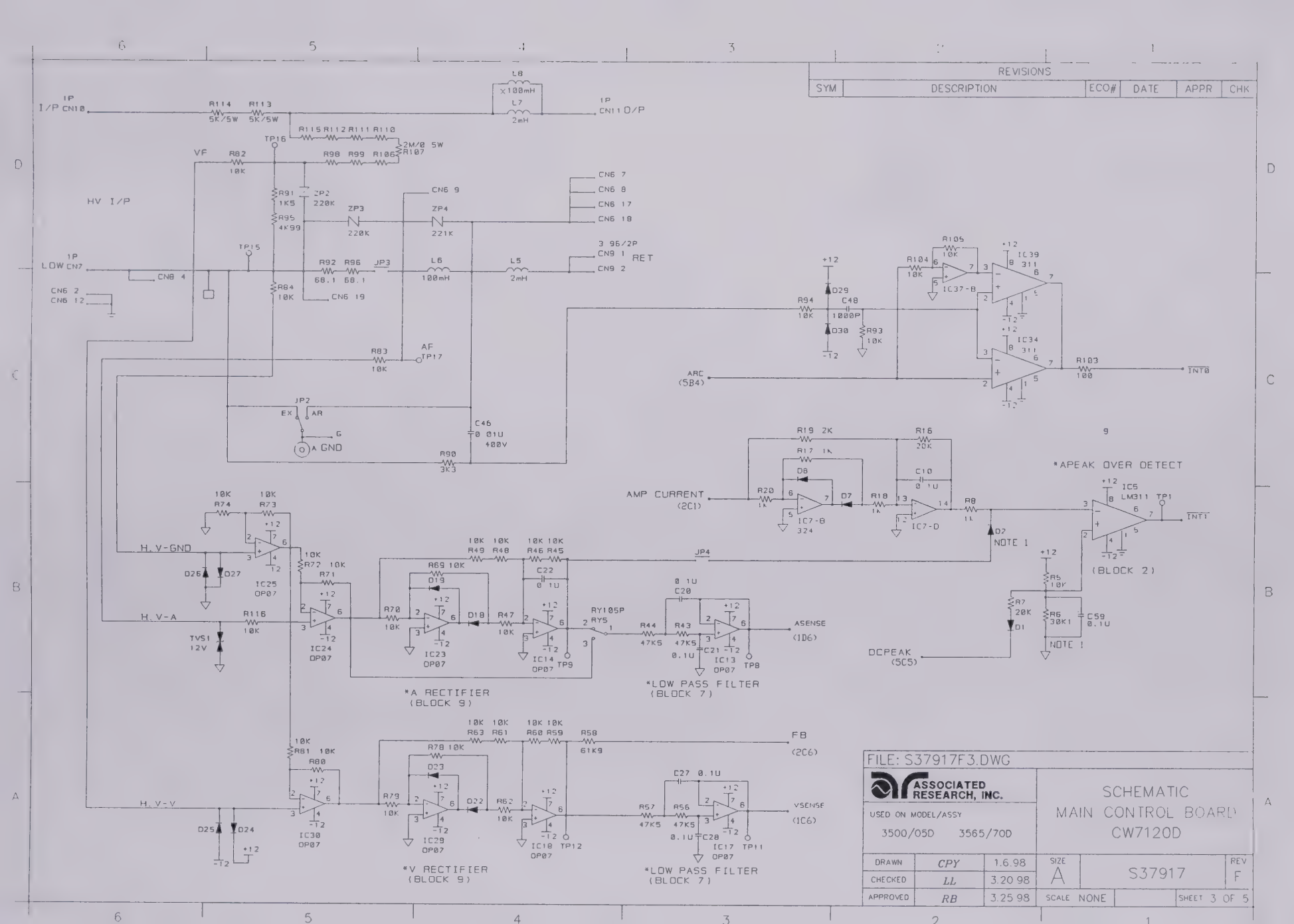
FILE: S37917F2.DWG

ASSOCIATED RESEARCH, INC.

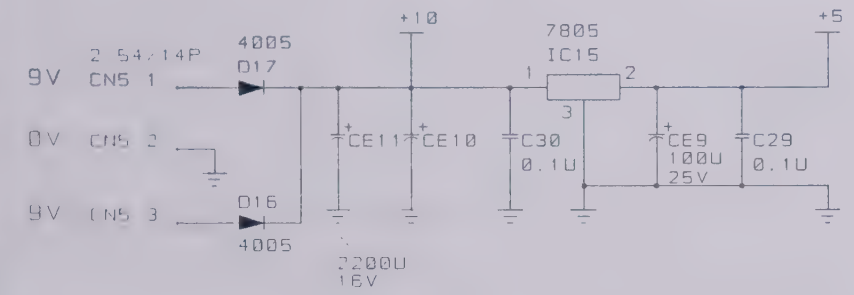
USED ON MODEL/ASSY
3500/05D 3565/70D

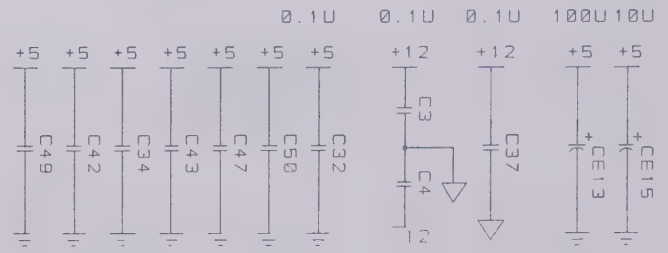
SCHEMATIC
MAIN CONTROL BOARD
CW7120D

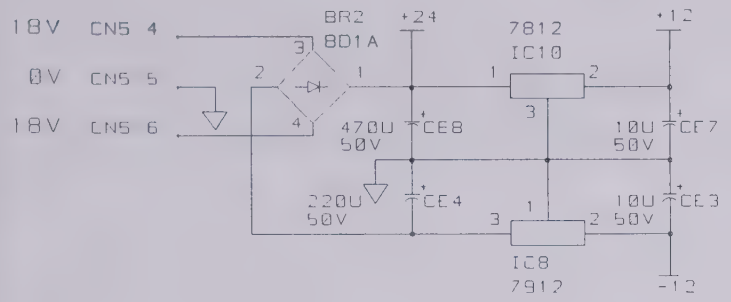
DRAWN	CPY	1.6.98	SIZE A	S37917	REV F
CHECKED	LL	3.20.98			
APPROVED	RB	3.25.98	SCALE NONE		SHEET 2 OF 5


REVISIONS
SYM | DESCRIPTION | ECO# | DATE | APPR | CHK
1P I/P CN10
R114 5K/5W
R113 5K/5W
L8 x100mH
L7 2mH
1P CN11 O/P
R115 R112 R111 R110
2M/0 5W R107
TP16
VF
R82 10K
R98 R99 R106
HV I/P
R91 1K5
ZP2 220K
R95 4K99
ZP3 220K
ZP4 221K
CN6 9
CN6 7
CN6 8
CN6 17
CN6 18
3 96/2P CN9 1 RET
CN9 2
1P LOW CN7
CN8 4
TP15
R92 68.1
R96 68.1
JP3
L6 100mH
L5 2mH
CN6 2
CN6 12
R84 10K
CN6 19
R83 10K
AF TP17
JP2
EX AR
G
A GND
C46 0.01U 400V
R90 3K3
+12
D29
C48 1000P
D30
R93 10K
-12
R94 10K
R105 10K
R104 10K
IC39 311
IC37-B
IC34 311
R103 100
ARC (5B4)
INT0
R19 2K
R16 20K
R17 1K
D8
C10 0.1U
AMP CURRENT (2C1)
R20 1K
IC7-B 324
D7
R18 1K
IC7-D
R8 1K
D2
NOTE 1
*APEAK OVER DETECT
IC5 LM311
TP1
INT1
(BLOCK 2)
R5 10K
R7 20K
D1
R6 30K1
C59 0.1U
NOTE 1
DCPEAK (5C5)
10K R74
10K R73
H.V-GND
D26
D27
IC25 OP07
10K R72
10K R71
H.V-A
R116 10K
TVS1 12V
IC24 OP07
R70 10K
IC23 OP07
D18
R47 10K
IC14 OP07
TP9
10K R49
10K R48
10K R46
10K R45
R69 10K
D19
C22 0.1U
JP4
RY105P
RY5
C20 0.1U
R44 47K5
R43 47K5
C21 0.1U
IC13 OP07
TP8
ASENSE (1D6)
*A RECTIFIER (BLOCK 9)
*LOW PASS FILTER (BLOCK 7)
10K R81
10K R80
H.V-V
D25
D24
IC30 OP07
R79 10K
IC29 OP07
D22
R62 10K
IC18 OP07
TP12
10K R63
10K R61
10K R60
10K R59
R58 61K9
R78 10K
D23
FB (2C6)
C27 0.1U
R57 47K5
R56 47K5
C28 0.1U
IC17 OP07
TP11
VSENSE (1C6)
*V RECTIFIER (BLOCK 9)
*LOW PASS FILTER (BLOCK 7)
FILE: S37917F3.DWG
ASSOCIATED RESEARCH, INC.
USED ON MODEL/ASSY
3500/05D 3565/70D
SCHEMATIC
MAIN CONTROL BOARD
CW7120D
DRAWN CPY 1.6.98
CHECKED LL 3.20.98
APPROVED RB 3.25.98
SIZE A
S37917
REV F
SCALE NONE
SHEET 3 OF 5

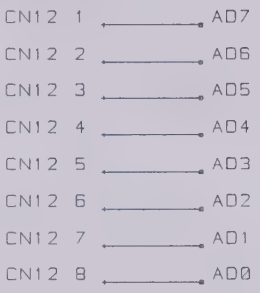
REVISIONS					
STM	DESCRIPTION	ECO#	DATE	APPR	CHK



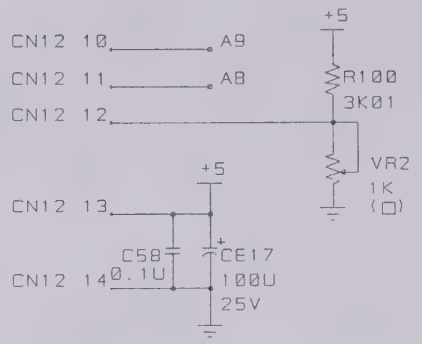


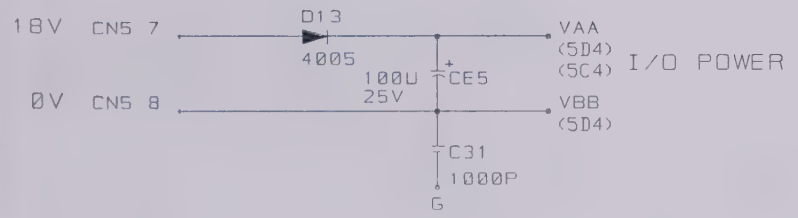


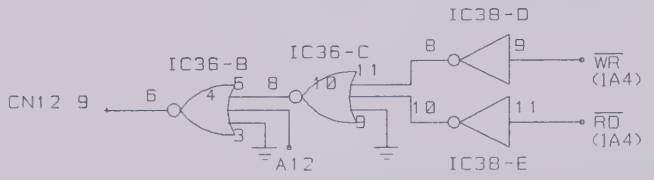
*LCD DISPLAY

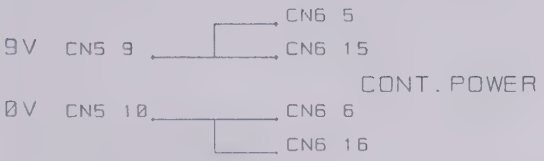


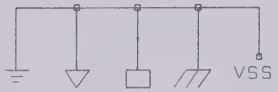
*LCD ADJ











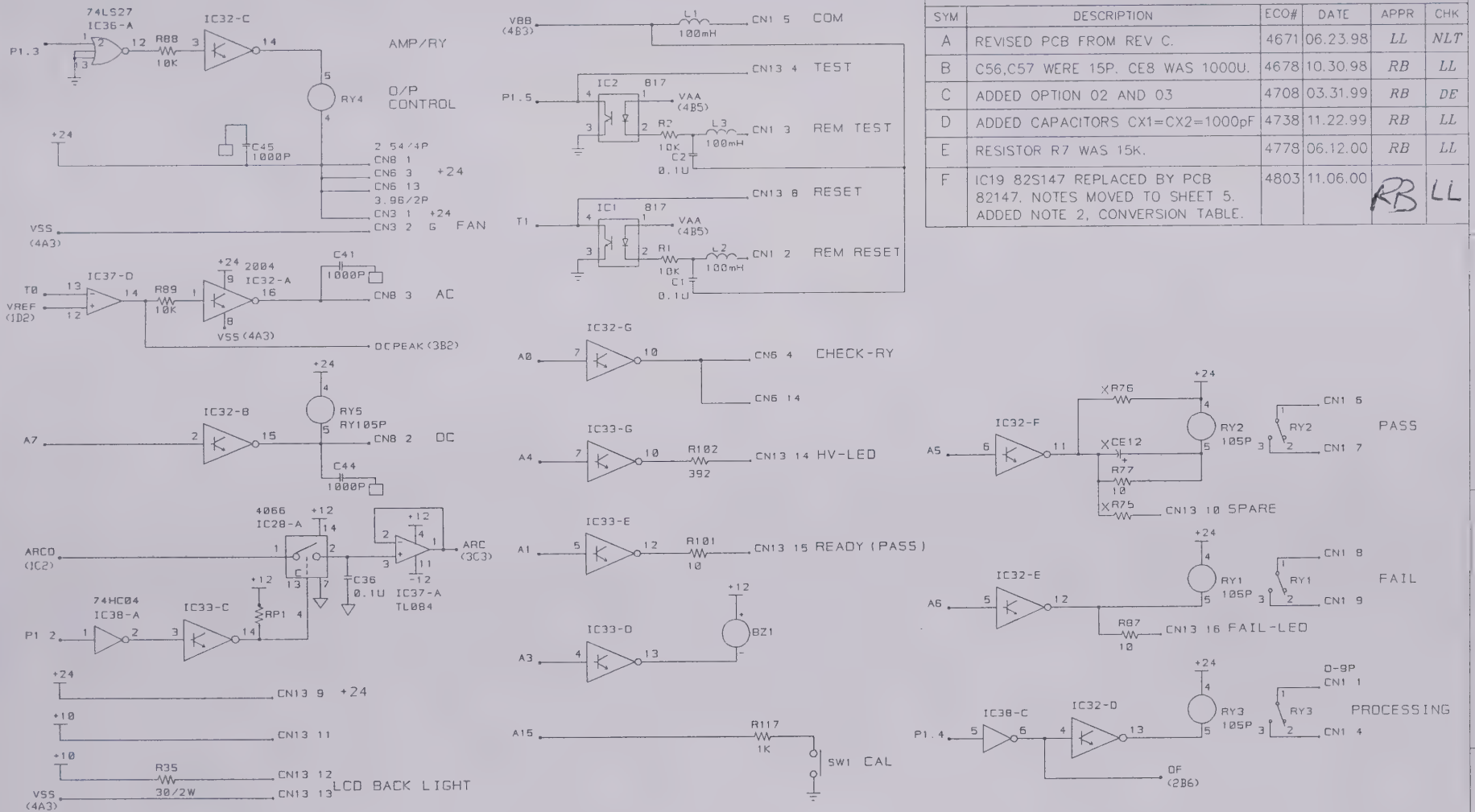
FILE: S37917F4.DWG

ASSOCIATED RESEARCH, INC.

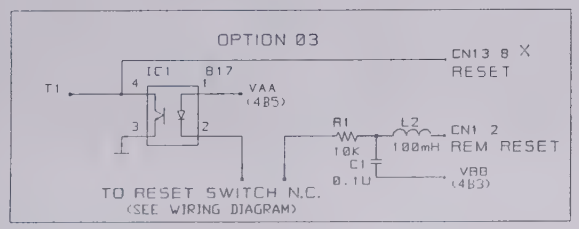
USED ON MODEL/ASSY
3500/05D 3565/70D

SCHEMATIC
MAIN CONTROL BOARD
CW7120D

DRAWN	CPY	1.6.98	SIZE A	S37917	REV F
CHECKED	LL	3.20 98			
APPROVED	RB	3 25 98	SCALE NONE		SHEET 4 OF 5



REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK
A	REVISED PCB FROM REV C.	4671	06.23.98	LL	NLT
B	C56,C57 WERE 15P. CE8 WAS 1000U.	4678	10.30.98	RB	LL
C	ADDED OPTION 02 AND 03	4708	03.31.99	RB	DE
D	ADDED CAPACITORS CX1=CX2=1000pF	4738	11.22.99	RB	LL
E	RESISTOR R7 WAS 15K.	4778	06.12.00	RB	LL
F	IC19 82S147 REPLACED BY PCB 82147. NOTES MOVED TO SHEET 5. ADDED NOTE 2, CONVERSION TABLE.	4803	11.06.00	RB	LL



NOTES:
1. OPTION 02: D2=1K, R6=165. SEE SHEET 3, B1, B2.
2 PCB 82147 INSTALLED IN LOCATION IC 19 SEE CONVERSION TABLE ON SHEET 2.

FILE: S37917F5.DWG

ASSOCIATED RESEARCH, INC.

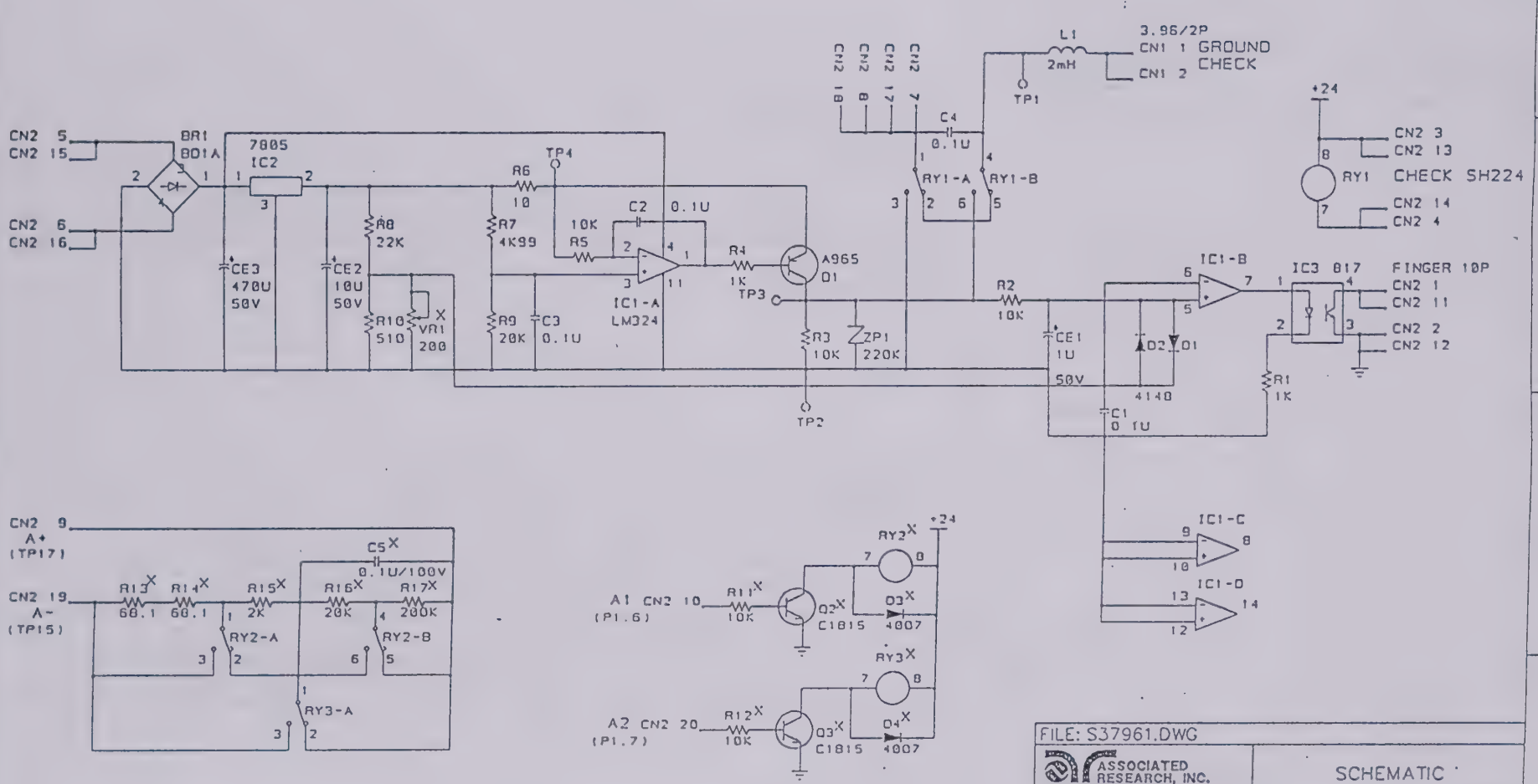
USED ON MODEL/ASSY
3500/05D 3565/70D

SCHEMATIC
MAIN CONTROL BOARD
CW7120D

DRAWN	CPY	1.6.98
CHECKED	LL	3.20 98
APPROVED	RB	3.25.98

SIZE A | S37917 | REV F
SCALE NONE | SHEET 5 OF 5

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK



FILE: S37961.DWG

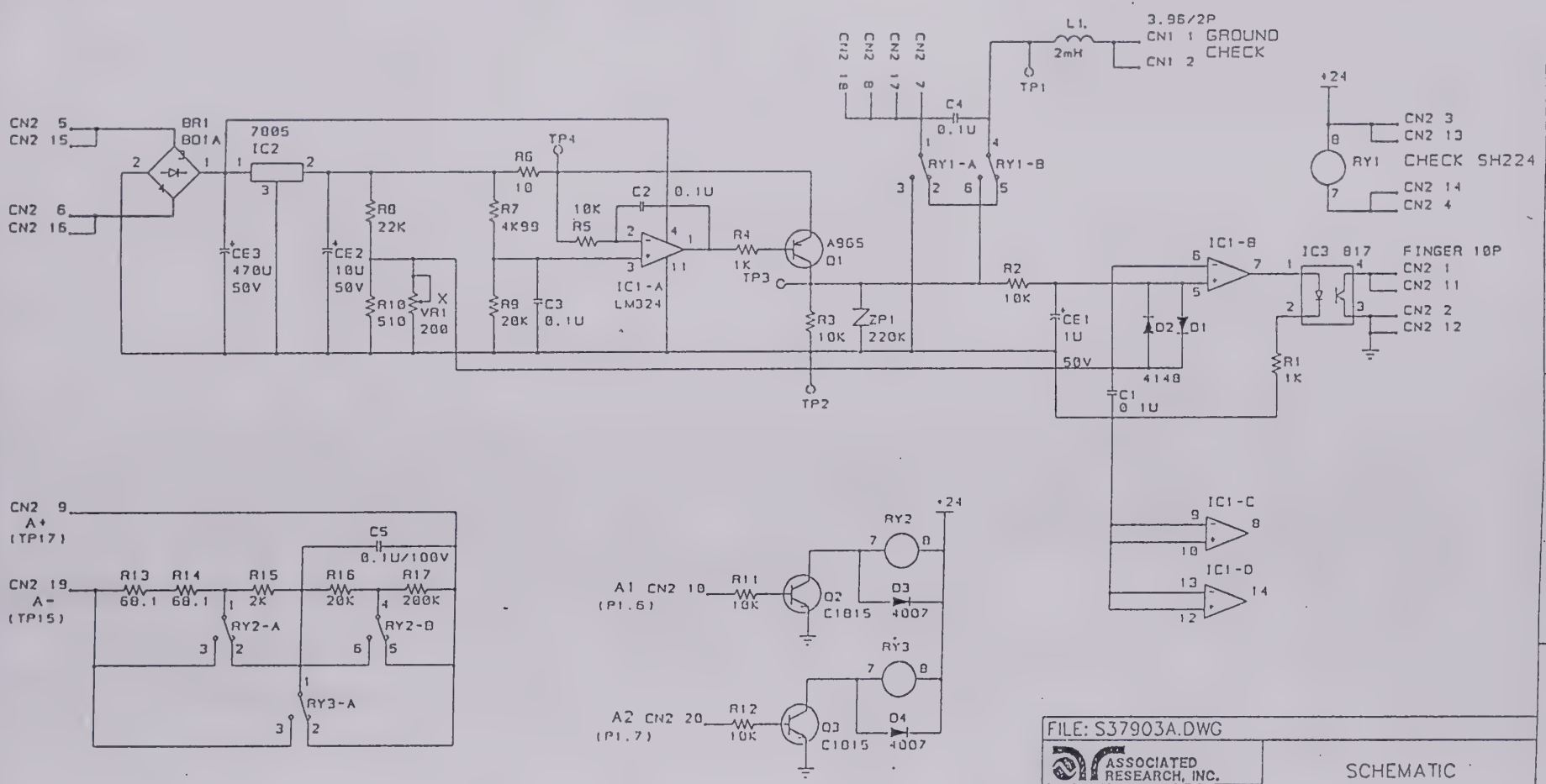
ASSOCIATED RESEARCH, INC.

USED ON MODEL/ASSY
3500/05D 3560/65D

SCHEMATIC
GND. CONT. CHK. BOARD
CGC-03

DRAWN	CPY	11.13.97	SIZE	S37961	REV
CHECKED	NLT	6.24.98	A		-
APPROVED	LL	6.24.98	SCALE NONE		SHEET 1 OF 1

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK
A	CORRECTED DRAWING AT D3 AND D4	4671	06.23.98	LL	NET



FILE: S37903A.DWG

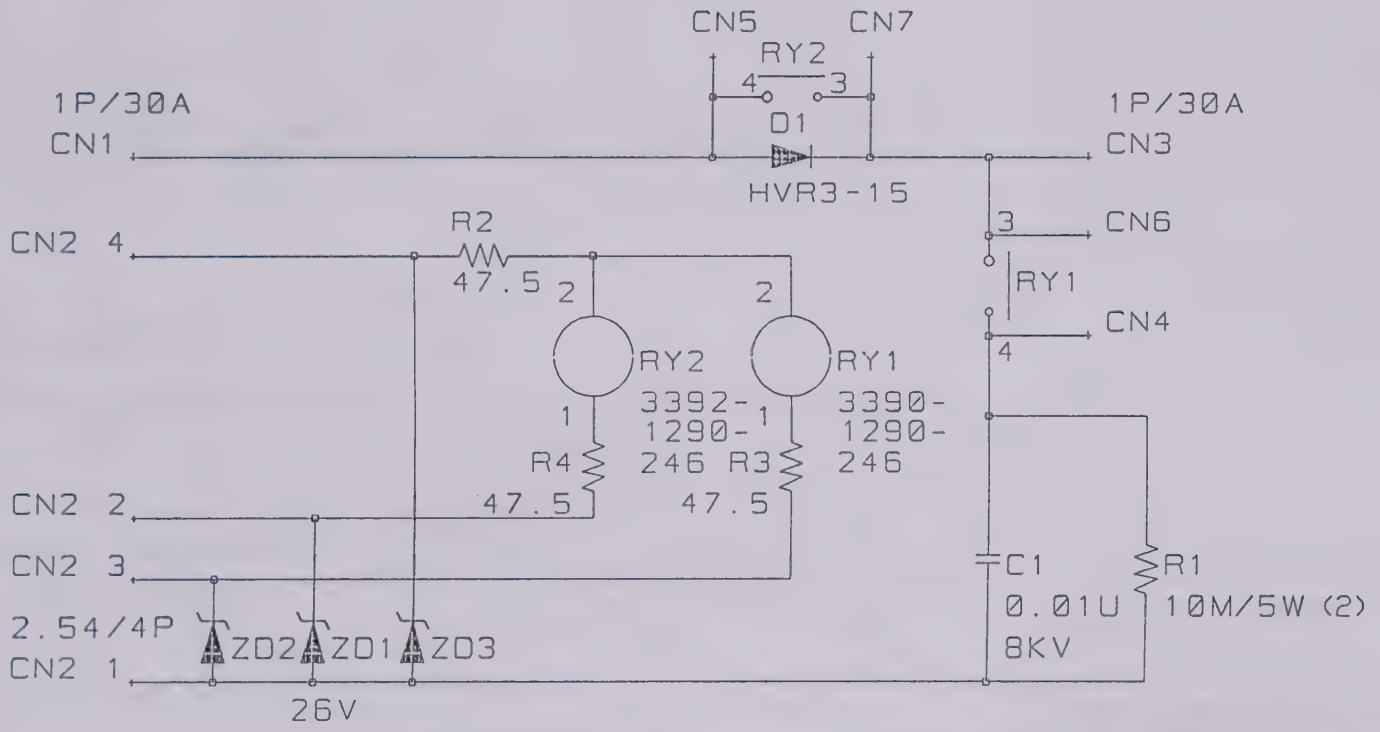
ASSOCIATED RESEARCH, INC.

USED ON MODEL/ASSY
3570D

SCHEMATIC
GND. CONT. CHK. BOARD
CGC-03

DRAWN	CPY	11.13.97	SIZE A	S37903	REV A
CHECKED	LL	3.25.98			
APPROVED	RB	3.25.98	SCALE NONE		SHEET 1 OF 1

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK
A	ADDED 3505D AND 3565D.	4636	12.19.96	RB	NLT
B	REVISED PCB FROM REV A, ADDED ZD1, ZD2, R2. RY1 WAS 3390-1270-246 AND RY2 WAS 3392-1270-246. REMOVED MODELS 3500D AND 3505D.	4659	08.08.97	RB	NLT
C	REVISED PCB FROM REV B. ADDED ZD3, R3, R4. R2 WAS 10M.	4671	06.23.98	LL	NLT



FILE: S37590C.DWG

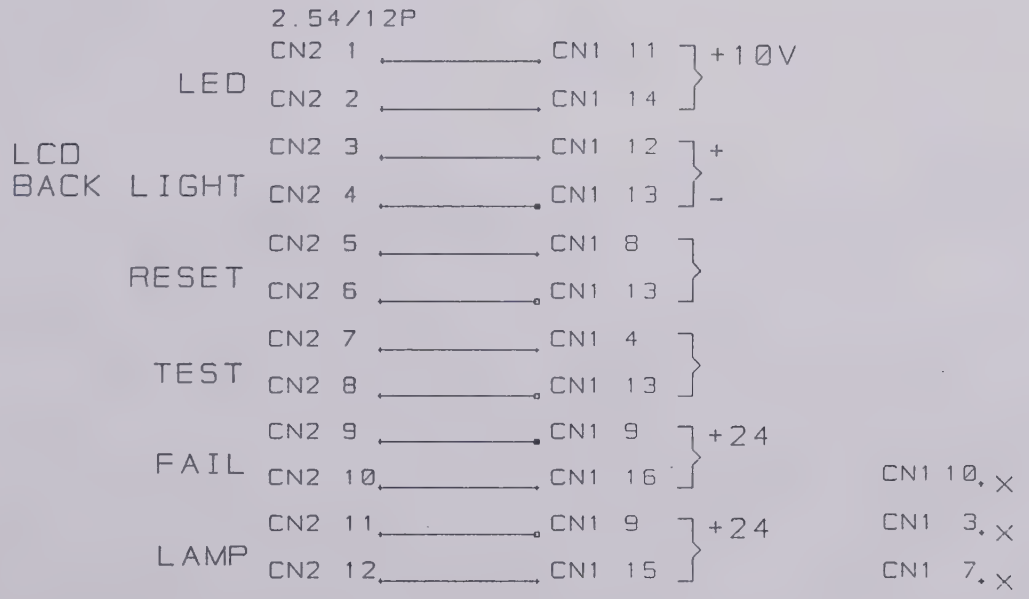
ASSOCIATED RESEARCH, INC.

USED ON MODEL/ASSY
3565D 3570D

SCHEMATIC
PCB HV CONTROL AC/DC
CHV-04C

DRAWN	CPY	08.31.95	SIZE A	S37590	REV C
CHECKED	NLT	11.15.95			
APPROVED	RB	11.15.95	SCALE NONE		SHEET 1 OF 1

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK
A	CONT WAS PASS, ADDED 205D AND NOTE 1.	4635	12.06.96	*RB*	*NLT*
B	ADDED 3505D AND 3565D.	4636	12.19.96	*RB*	*NLT*
C	PCB WAS CKB-02, REMOVED 3560D, ADDED 3570D, CN1 5 WAS P1.6, CN1 6 WAS P1.7.	4671	06.23.98	*LL*	*NLT*
D	ADDED MODEL 3030D AND TABLE 1. DELETED: A10(R119), A11(R118), HV-LED, CONT LAMP NOTE 1, NOTES:.	–	06.29.98	*RB*	*LL*
E	ADDED MODEL 4500D. REVISED TABLE 1. REDRAWN.	–	12.17.99	*RB*	*LL*



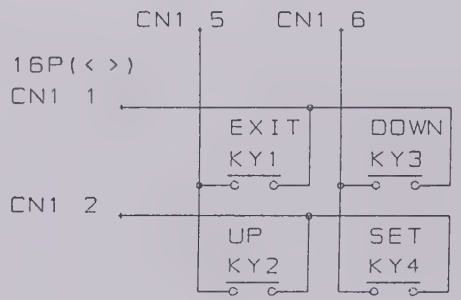


TABLE 1

REFERENCE	MODEL			
	205D	3030D	3500-70D	4500D
CN1 1	C4	C4	C4	P1.6
CN1 2	C5	C5	C5	P1.7
CN1 4	P1.5	P1.5	P1.5	PB4
CN1 5	P1.6	P1.6	A10 (R119)	PB0
CN1 6	P1.7	P1.7	A11 (R118)	PB1
CN1 8	INT0	INT0	INT0	T1
CN1 13	G	G	G	G1
CN1 14	HV-LED	TEST-LED	HV-LED	HV-LED
CN1 15	X	PASS LAMP	CONT LAMP	READY
CN1 16	FAIL LAMP	FAIL LAMP	FAIL LAMP	FAIL-LED

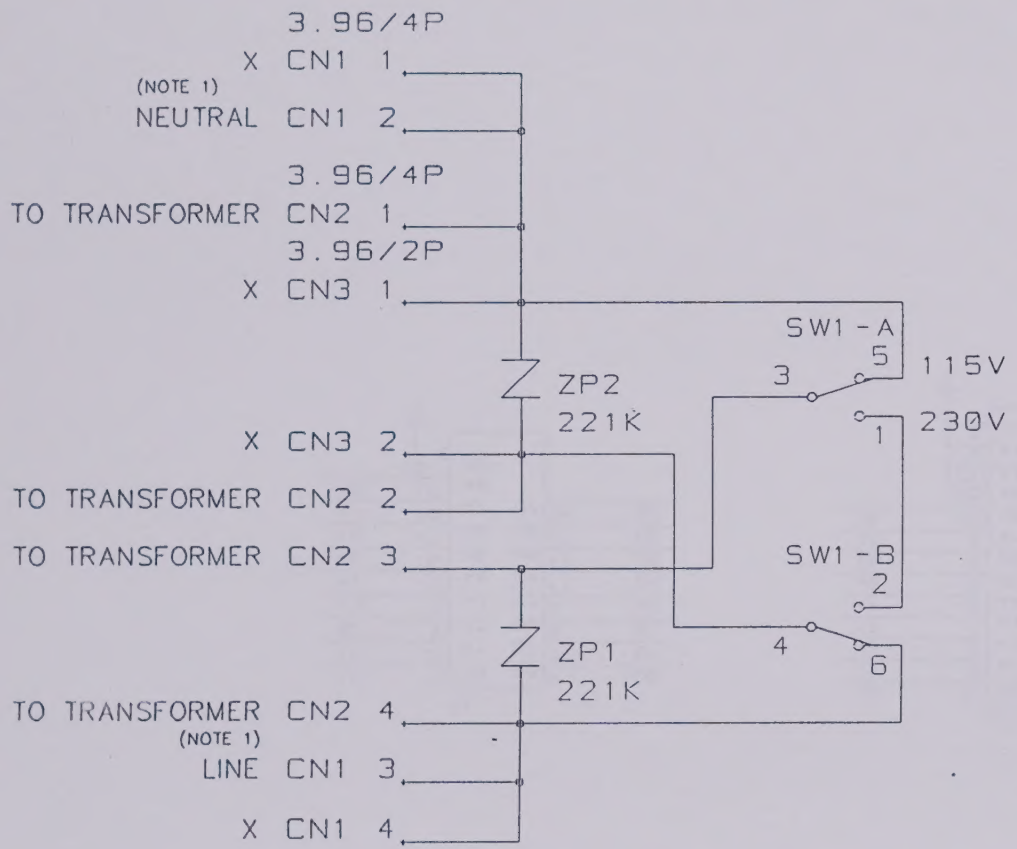
FILE: S37593E.DWG

ASSOCIATED RESEARCH, INC.

USED ON MODEL/ASSY
205D 3030D 3500-70D 4500D

SCHEMATIC
PCB KEYPAD
CKB-02A

DRAWN	*CPY*	08.24.95	SIZE A	S37593	REV E
CHECKED	*NLT*	11.15.95			
APPROVED	*RB*	11.15.95	SCALE NONE		SHEET 1 OF 1



NOTES:

1. FOR 5500DT AND 5560DT LINE AND NEUTRAL ARE REVERSED.
LINE CONNECTS TO CN1 PIN2, NEUTRAL CONNECTS TO PIN3.

REVISIONS

SYM	DESCRIPTION	ECO#	DATE	APPR	CHK
A	REVISED PCB FROM CSW-01 TO CSW-01A. SCHEMATIC UNCHANGED.	–	10.03.95	RB	NLT
B	REVISED PCB FROM CSW-01A TO CSW-01B. DELETED C1 AND REDRAWN.	4592	11.15.95	RB	NLT
C	ADDED 205D.	4635	12.06.96	RB	NLT
D	ADDED 3505/65D, 5500/60DT, 6554SA.	4636	12.19.96	RB	NLT
E	REVISED PCB FROM CSW-01B TO CSW-01C. SCHEMATIC UNCHANGED. ADDED MODEL 5030DT.	4649	7.14.97	RB	NLT
F	ADDED MODEL 520L, 3030D, 3570D. REMOVED MODEL 3560D AND 6554SA. CORRECTED REFERENCES ON CN1 1, CN1 4, CN3 1, CN3 2.	–	06.29.98	RB	LL
G	CORRECTED LABELS OF CN1 AND CN2. CN1 PIN2 AND PIN3 WERE IN. CN2 PIN1 AND PIN3 WERE 115, PIN2 AND PIN4 WERE 0V. ADDED NOTE 1.	4751	02.09.00	RB	LL
H	MODEL 5560DT ADDED TO NOTE 1.	4767	04.24.00	RB	LL

FILE: S37515H.DWG

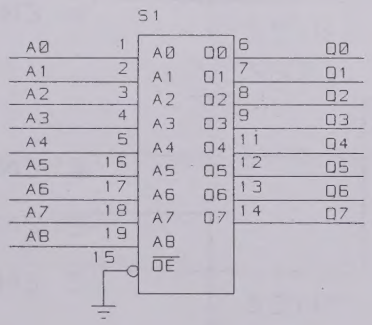
ASSOCIATED RESEARCH, INC.

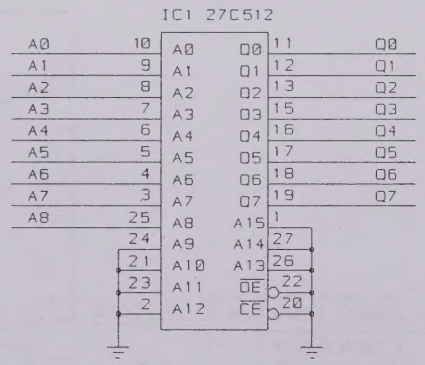
USED ON MODEL/ASSY
205D 520L 3030D
3500D 3505D 3565D 3570D
5030DT 5500DT 5560DT

SCHEMATIC
INPUT PROTECTION PCB
CSW-01C

			SIZE		REV
DRAWN	CPY	06.16.95	A	S37515	H
CHECKED	NLT	11.15.95			
APPROVED	RB	11.15.95	SCALE NONE		SHEET 1 OF 1

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK





FILE: S38220.DWG

ASSOCIATED RESEARCH, INC.

USED ON MODEL/ASSY
35xxD, 3030D, 55xxDT, 5030DT

SCHEMATIC
ROM CONVERSION BOARD
82147

DRAWN	CPY	05.17.00	SIZE A	S38220	REV –
CHECKED	LL	11.3.00			
APPROVED	RB	11-6-00	SCALE NONE		SHEET 1 OF 1

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